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VOLUME 37, No. 26

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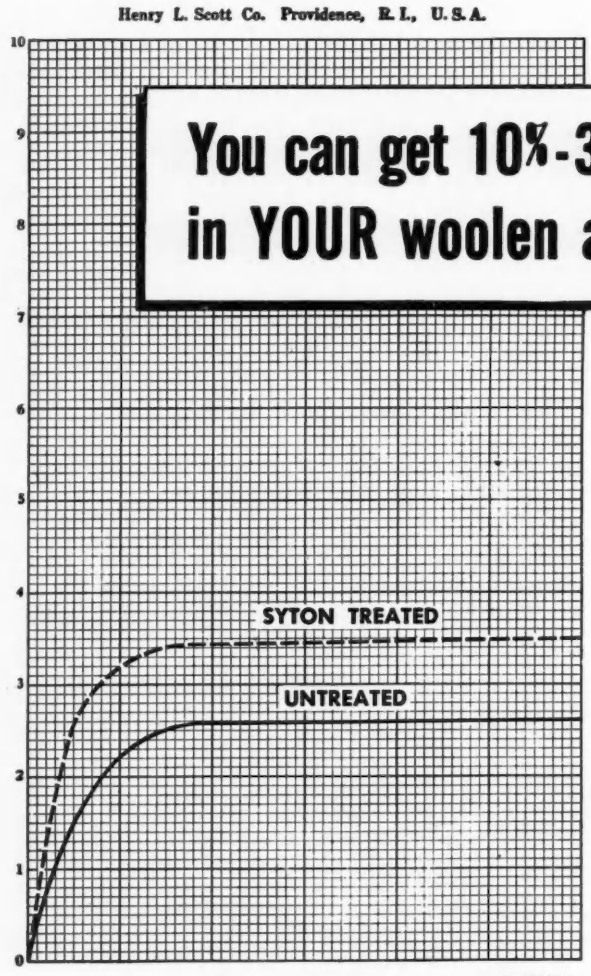

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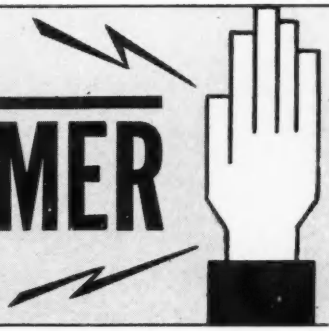

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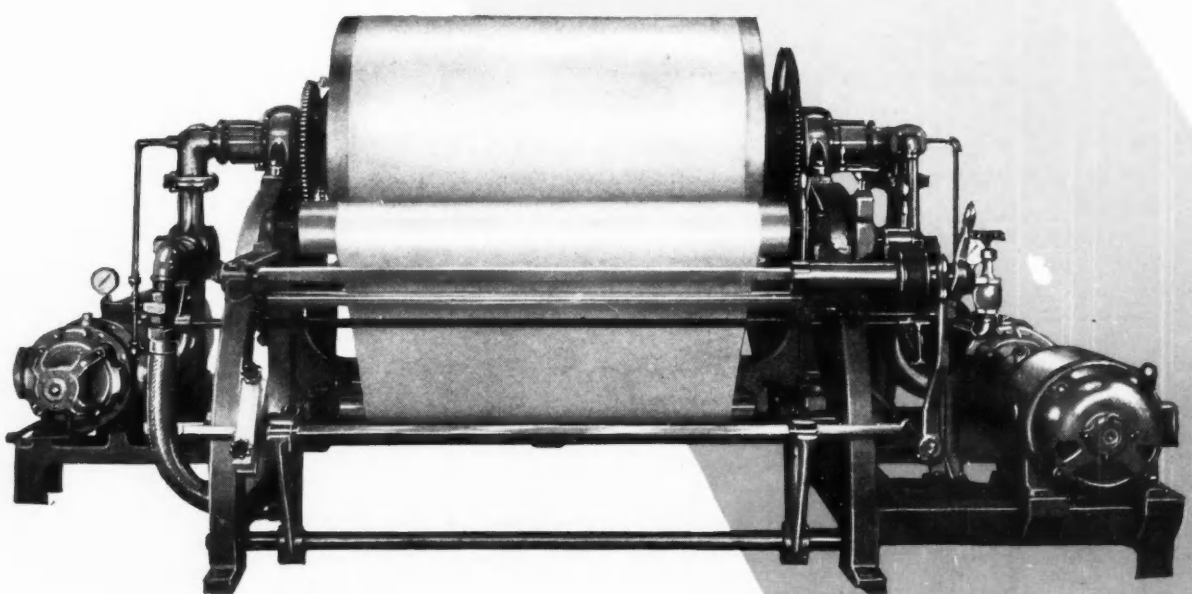

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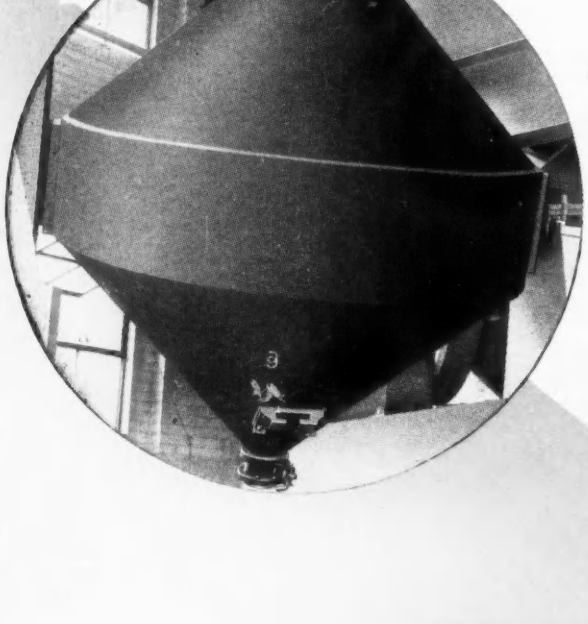

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DYESTUFF REPORTER

VOLUME 37 DECEMBER 27, 1948 NUMBER 26

ANIMALIZATION OF CELLULOSIC FIBERS

DOMENICO FORNELLI

Textile Technologist, Leumann, Turin, Italy

Introduction

RECENT advances in modifying man-made cellulosic fibers actually duplicate the physical and chemical properties of wool, its feel, its non-conductance, degree of luster, curl, and also its wrinkly surface.

These characteristics can be obtained, as in the case of curl, for instance, by submitting such cellulosic fibers to an alternately graded elongation or by exposing the bended fibers, while wet, to the effects of micellary swelling.

A number of processes produce the above mentioned physical effects, be it by varying the operations of spinning and coagulation, or by the introduction of different substances into the body of fibers, or by submitting them to chemical processes.

The limit of the chemical resemblance obtainable, however, does not surpass the tinctorial reactivity characteristic of animal fibers, unless modified protein substances are used, in a quantity sufficient to extend their specific reactivity to the complex of the resulting fiber.

The tinctorial reactivity is interesting from the chemical point of view for obtaining fibers that dye as wool in order to eliminate the difficulties encountered by dyers in dyeing mixed fabrics.

Fibers which dye similarly to animal fibers are called "animalized."

The processes used for this purpose consist in the introduction into the body of the fiber, of N-containing organic substances thus resulting substantially in a basification of fibers.

The presence of N-containing bodies inside or on the surface of the fibers allow it to absorb acid dyestuffs. For the fibers to possess affinity for basic dyestuffs it is necessary to introduce acid radicals, which can confer this affinity as is the case with the cellulose esters.

The animalization processes can be applied on natural or man-made cellulosic fibers and also on the high polymer synthetic fibers.

Cotton itself can actually be dyed with acid dyestuffs of the series of the Eosines, Croceines and a few other dyestuffs after mordanting with sodium stannate or in a bath containing Glauber's salt and alum, but the shades obtained are not fast.

Old records as far back as 1890 indicate a first basification of cotton according to the process of the Frenchman Leo Vignon *(1)* who treated cotton in a closed tube with 4 parts of an ammoniacal calcium chloride and 4 parts of aqueous ammonia for some hours at 100-200° C., obtaining a cotton dyeable with Orange II, Roccelline, etc.

We find afterwards in 1926 another attempt, according to Karrer and Wehrli's process *(2)*.

The studies to modify the tinctorial properties of cotton have been orientated towards the esterification of native cellulose by means of aromatic acid chlorides as benzoic or phthalic but especially paratoluenesulfonic acid chloride.

In a typical example of localized reaction, cotton was superficially esterified with paratoluenesulfochloride in the presence of solvent. It was discovered that the resulting fibers showed no affinity towards direct dyestuffs but acquired affinity towards the basic dyes. According to this process invented by Tagliani-Sandoz, the cotton thus treated was called "immunized." *(3)*

Karrer and Wehrli modified this process, by partially esterifying the cotton with paratoluenesulfochloride and then causing ammonia to react with it at a temperature of 100° C. The paratoluenesulfonic residual is separated and substituted by an amine group. The cotton fixes 0.8% of N and can be dyed with acid dyestuffs with good fastness.

This type of cotton was called "amined or animalizated." The poor economics of the process prevented its practical development.

Since 1913 *(4)* however, colored effects on cellulose fibers by means of acid or basic dyestuffs have been obtained in printing, by fixing these dyestuffs on fabrics by means of resins of the phenoplastic type added to the printing pastes.

Concerning the animalization of the different types of rayon, we must realize that acetate rayon differs completely from the other types of rayon in dyeing, and that this is accomplished by using dispersed or solubilized dyestuffs, by modifying the surface of the fiber, by saponification or by means of processes causing swelling.

By an alkaline treatment (saponification) acetate rayon acquires affinity towards substantive dyestuffs but it is by means of swelling processes only that it can acquire affinity towards the acid dyestuffs.

Because of its acid character acetate rayon has affinity towards basic dyestuffs which is the stronger the more accentuated is their basicity and the smaller their molecule.

A fundamental difference of acetate rayon is its ability to acquire greater affinity towards acid dyestuffs by dyeing in the presence of swelling agents such as the lower aliphatic alcohols, formic acid, thiocyanates, ethyl lactate, etc. or after a previous mordanting to impart affinity for chrome dyestuffs.

These processes are not, of course, to be considered animalization processes, and, generally speaking, they are not economi-

cal nor completely suitable, so that the basification of acetate rayon has been studied with considerable emphasis.

In the field of purely synthetic fibers, linear polymers of the vinylic type (Vinyon and Pe-Ce) can absorb, to a certain intensity, acid dyes in the presence of solvents such as ethylcellosolve. Polyamides and polyuretanes like nylon and Perlon, because of their accentuated hydrophobic tendencies, impede an intense absorption of the acid dyestuffs naturally conferred by the presence in the molecule of the —CONH— or —OCONH— groups respectively; nevertheless, numerous animalization processes have been considered for these fibers, particularly for the vinylic type, though the industrial applications have been realized only with man made cellulosic fibers.

Methods of Animalization

We can divide the methods used for the animalization into:

1) Animalization by means of protein substances.

2) Animalization by means of non protein N-containing substances.

3) Animalization by means of mixtures or reaction products of protein and non-protein N-(or S-)containing substances.

The methods of application can be divided thus:

A) Introduction of the animalizing substances in the mass of the rayon before spinning.

Such introduction can be carried out in different stages according to the relative process. Viscose rayon can be animalized for instance when cellulose is at the stage of alkali, xanthate or viscose.

B) Formation (or fixation) of the animalizing substance in (or on) the body of the fiber after spinning.

This is carried out by adding the animalizing substance to the coagulation bath or by treatment of the coagulated thread or of the textile material (as yarns, fabrics) with the animalizing substance applied in gaseous form, as solution or emulsion. The animalizing substance can be already formed or able to form in the fiber following certain reactions: condensation, polycondensation, or polymerization caused by curing and favored by catalysts.

The treatment of the textile materials can be considered as a previous mordanting and carried out immediately before dyeing.

Animalization simultaneous to dyeing has to be rejected because of the deficiences in its results.

To these methods of application can be added the so-called "fixation," that is the deposit of the animalizing substance on the fiber at a soluble stage (generally as a resin pre-condensate) mixed with acid dyestuffs and thickening agents in average printing pastes according to the usual technic. The subsequent vaporization insolubilizes the resin in the printed area and fixes the acid dyestuffs.

(1) Animalization by Means of Protein Substances

The incorporation of proteins in manmade cellulosic fibers has been industrially realized in some countries, by adding them in various proportions to the solutions of the different types of rayon immediately before spinning.

Animal and vegetable proteins or protein-like substances have all been used. The best time for the incorporation of the protein substance is just before the extrusion of the rayon, particularly in the case of viscose, where the solutions are strongly alkaline, as cellulose xanthate is soluble only in aqueous solutions of caustic soda. To avoid an alteration of the protein substance, easy under these conditions, the shortest period of contact is necessary.

Since 1935, Italy has produced and marketed rayon fibers containing a percentage of protein, mainly Cisalfa and Sniabeta.

Cisalfa is a viscose staple fiber produced with viscose containing 3-5% casein and TiO_2 as a dulling agent. Having a curliness like that of wool, these fibers are mainly used for mixture with wool. Cisalfa was produced by Cisa-Viscosa in 4 types:

Type 2—corresponding to Merino 125÷130 fiber 18 microns

Type 4—corresponding to Merino 100÷105 fiber 20 microns

Type 5—corresponding to 56s÷58s fiber 25 microns

Type 12A—corresponding to 46s÷48s fiber 29 microns with numbers respectively of 2-4-5-12 denier. Standard length of 100÷80÷40 mm.

Sniabeta is a viscose staple fiber with 5% viscose and dulling agent, produced by Snia-Viscosa.

Another staple fiber of similar type was Lacisana, produced by Cisa-Viscosa.

These types of fibers, although better in feel than the ordinary viscose rayon or staple fiber and having superior insulating power, are deficient in tensile strength.

The quantity of incorporated protein is too low to confer to these fibers a decisive affinity towards acid dyestuffs, and their advantages lie only in their feel and warmth. Railan is one type of rayon which actually contains a high percentage of casein.

The protein used for animalization can also be applied in solution form, i.e. keratin in a solution of sodium sulfide *(5)*.

All types of rayon, including viscose, cupro, acetate and nitro can be animalized.

An animalized fiber obtainable by adding a caustic soda solution of animal wastes to commercial collodion was also suggested *(6)*.

For cellulose acetate, a natural macromolecule, which is in a certain sense a protein-like substance was suggested: chitin extracted from crustaceous-shells.

In Germany the I.G. obtained patents for the manufacture of cellulosic rayons containing casein, coagulated in formaldehyde solution (7).

One of the German industrial applications of strongly animalized rayon was "Floxalan," a viscose containing 30% of casein. During recent years the Germans studied the use of "Viking" albumin added to the viscose solution.

Viking is an albumin obtained from fish-meat according to the "Hiltzner and Meltzner" process of the Deutsche Eiweissgesellschaft of Hamburg.

The use of fish-albumin was suggested by the fact that it is more resistant than casein to decomposition with alkali; in fact, to obtain a spinnable casein solution about three hours are needed, while for fish-albumin under the same conditions, it takes 48 hrs. (8).

The percentage of 10-20% of fish-albumin is considered sufficient to confer to a cellulosic rayon the property of dyeing like wool.

Other European protein-containing rayons were the French Fibre L and Sérésa (Comptoir des Textiles Artificielles) and the Belgian Fibramine (Fabelta S.A.), Lanalfa and Lanabeta (Soc. Cotonniere. Bruxelles).

A percentage of protein lower than 5% is generally preferred for the fact that a proportion of 20-30% considerably increases the swelling and consequently decreases the tensile strength.

(2) Animalization by Means of Non Protein N-Containing Substances

(a) Amines, polyamines, amides, polyamides, their reaction products, quaternary ammonium salts, etc.

We have already mentioned the reaction of ammoniacal compounds on cotton for its animalization. Experiments have been made in Germany to obtain ammoniacal celluloses by treating cellulose with liquid synthetic ammonia (9).

The use of primary, secondary and tertiary amines, particularly those of high molecular weight has been considered for animalization and also the use of heterocyclic bases like pyridine added to the spinning mass (10).

The studies of the I.G. in this field include the effects of halogenated fatty amines or their derivatives. The addition to the viscose mass of stearylamine acetate (11), the treatment of viscose rayon with

bromoethylamine (*12*) or with the fatty derivatives of isatinic acid anhydride (*13*) have also been attempted.

The treatment of rayon with formaldehyde and pyridine chloride in a solvent such as chloroform has also been suggested (*14*).

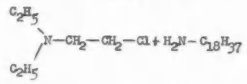
A variety of reaction products of amines and their derivatives with organic compounds have been considered.

According to a recent process the viscose fibers are treated with a solution containing formaldehyde, a tertiary hydroxyamine as triethanolamine and ammonium chloride, following a curing at 150°C. It is supposed (*15*) that cellulose is transformed into a compound of the following formula:

Cell—OCH_2O—$(C_2H_4)N(C_2H_4O)_2$—HCl

According to another process the addition to viscose of condensation products of ethylene chloride or ethylenediamine with trichloroparaffin has been studied (*16*); another product, useful to add to the spinning mass, is that obtained from trichloroparaffin and a polyethylenepolyamine (*17*).

To the spinning mass can be incorporated products derivated from polyamines obtained by causing halogenated alkalamines to react with fatty amines, .ie. the product resulting by the action of diethylchloroethylamine on stearylamine (*18*).



For the animalization of acetate rayon compounds derived from ethylene oxide substituted by organic bases as propylene, piperidinic oxide added to the acetate mass in a convenient solvent have been used (*19*).

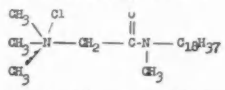
Urea has been considered (*20*) because it permits the fixation, to a certain point, of acid dyestuffs in printing cellulosic fabrics.

The cationic activity of quaternary ammonium compounds plays a complementary role in the animalization, which favors the affinity for acid dyestuffs. The positive electric charge conferred by these products to the fibers (negative) accelerates the dyeing process.

Quaternary ammonium, sulfonium and phosphonium compounds of the type, for example, used in fixing substantive dyes on cellulosic fibers, can also be used (*21*). By boiling a fabric for 20-30 min. in a solution containing 6-8% of cetylpyridinium chloride, an affinity towards acid dyestuffs can be conferred.

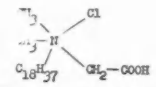
The quarternary type of compound, as known, is used to solubilize hydrophobic molecules. An application of this containing a basic N atom and aliphatic or cyclic radicals (aliphatic chloromethyl ethers) and containing radicals of at least ten C atoms, can confer a partial hydrophobization (*22*).

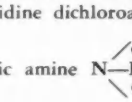
Useful for the treatment of viscose rayon and also possessing a complementary hydrophobizing effect, is the product obtained by the action of betaine chlorohydrate on methylstearylamine:

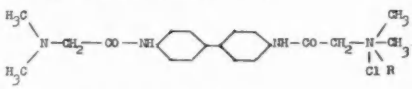


Products of a like type added to the viscose mass can be obtained by reaction of trimethylaminochloroacetic acid on stearylamine (*23*).

The cellulosic fibers can be impregnated with the condensation products obtained from tertiary amines and monochloroacetic acid, i.e., stearylbetaine (*24*):

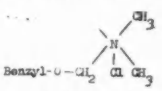


A preliminary treatment of cellulosic fibers with quaternary ammonium compounds such as those obtained by treating benzidine dichloroacetamide with an aliphatic amine  in which R is a radical of high molecular weight, e.g., compounds of the formula:



has been suggested (*25*).

Also suggested are quaternary compounds such as the octyloxy-methylbenzyl-oxymethyl-dimethylammonium chloride:



for treatment of fibers in water solution (*26*).

Another type of quaternary compound useful for dyeing with metachrome dyestuffs, after treatment of rayon, is that resulting by the action of the chlorohydrine of a polyglycerine on octodecyldimethylaniline (*27*).

The ammonium, sulfonium or phosphonium compounds were also suggested for the animalization of acetate rayon and synthetic fibers (*28*).

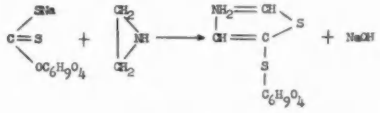
Among other different organic compounds which have been applied for animalization there is epychlorohydrine (*29*) and alkylene oxides.

(b) Ethyleneimine and its different reaction products

The recent phases of studies on animalization cover the study, during the last ten years, of this product for its development in textile chemistry.

Ethyleneimine is a highly reactive compound and has the property of polymerizing on fibers.

For the purpose of animalizing, the action of ethyleneimine can be carried out on alkali cellulose, (*30*) even during the xanthate stage. Complex N- and S- containing derivatives of cellulose, probably cellulose mercaptothiazolidin ethers are formed (*31*).



Ethylenimine can be caused to react with the xanthate already transformed into filament but not yet into regenerated cellulose, by treating it with the compound in the liquid or gaseous form at a temperature of 70-100° C. It can also be absorbed by rayon by heating in a closed vessel (*32*).

Many reaction products of ethylenimine can be used.

It has been suggested to add to the viscose mass, polymerized compounds obtained by evaporation of aqueous solutions of ethylenimine containing acids (*33*) or addition to the mass of the reaction products of ethyleneimine with CS_2 (*34*).

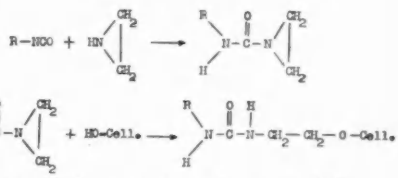
According to another process, treatment with ethylenimine can be preceded by a treatment with halogenoalkylamines (poly-δ-chloro-β-oxy-propylamines). This first treatment can also be carried out by using a polyvalent mercaptoalkylamine as the reaction product obtained from ethylenediamine and 4 molecules of propylenesulfide in the presence of a reducing agent (*35*).

(C) Reaction products of ethylenimine and isocyanates

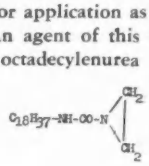
A field of reaction examined for animalization is that of ethylenimine and the isocyanates.

Ethylenimine reacts with isocyanates forming ethylenureas maintaining the ethyleniminic ring and a high reactivity towards the compounds of H.

The ethylenureas can react with hydroxylic compounds such as cellulose:

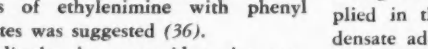


The ethylenureas have been studied particularly for application as hydrophobing agents. An agent of this type is Persistol VS or octadecylenurea



The isocyanates prepared by treating the corresponding amines with phosgene give an example of their reactivity with cellulose, used in an attempt to give effects of water-repellency.

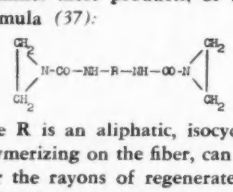
For the hydrophobization, according to the Infloss process, cellulose is caused to react with alkyl isocyanates of high molecular weight, with formation of carbamic acid esters according to the equation:



Such reaction is produced only after elimination of the solvent by heating the cellulosic material at 150° C.

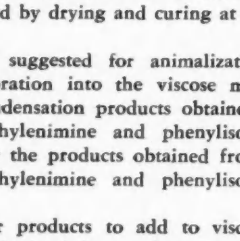
For animalization, the incorporation in the viscose mass of the polymerization products of ethylenimine with phenyl isocyanates was suggested *(36)*.

Accordingly the same idea also suggests the treatment of rayon with the reaction products of aliphatic, cycloaliphatic and arylaliphatic isocyanates with ethylenimine: these products, of the general formula *(37)*:



Where R is an aliphatic, isocyclic radical polymerizing on the fiber, can be used both for the rayons of regenerated cellulose as for the esters like acetate rayon.

A product, obtained probably according to this process, used on cuprammonium rayon to produce a permanent hydrophobization and to reduce the swelling power of the fibers is diethylenurea-I-6-hexamethylendiamine:

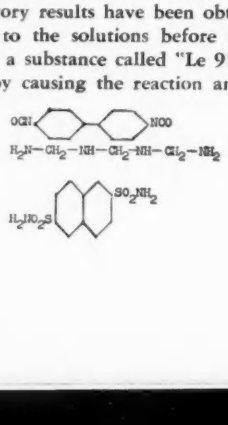


applied on the fabric in a 5% solution, followed by drying and curing at 120° C. *(38)*.

Also suggested for animalization, by incorporation into the viscose mass are the condensation products obtained from CS_2, ethylenimine and phenylisocyanate *(39)* or the products obtained from phenol, ethylenimine and phenylisocyanate *(40)*.

Other products to add to viscose are those obtained by condensation of arylisocyanates or isothiocyanates and polyalkylene-polyamines *(41)*.

According to recent investigations *(42)* satisfactory results have been obtained by adding to the solutions before spinning, 10% of a substance called "Le 9109" prepared by causing the reaction among:



Synthetic resins

For the purpose of animalizing fibers, resins both of the thermosetting and thermoplastic type, have been used.

Application in the spinning mass can be reserved to resins in the soluble or insoluble stage and, when the components are apt to form the resin "in situ", they are added separately. In all cases the curing of the fiber is necessary.

(D) Consensation products

Among the condensation products we find the phenoplastics, the aminoplastics and their reaction products.

Phenoplastics:

Resins were used at the beginning for the fixation of different materials to fibers, taking advantage of the fact that if applied in the soluble form of a precondensate added to the printing paste containing the acid dyestuffs, and insolubilizing by the heat of the steaming process, the color mechanically adhered to the fabrics. In this regard the condensation products of formaldehyde and phenol were used, however with no practical results *(43)*.

The phenol-aldehyde precondensates ("Novolacks") can give by reaction with other compounds, products more useful for animalization; i.e. the reaction products of Novolacks with halogeno amines as the β-chloroethyl-diethylamine *(44)*.

Aminoplastics

Types on the order of the urea-aldehyde resins were used to confer the animalization with a pre-treatment of textile materials. *(45, 46)*.

In place of urea, many of its derivatives namely, thiourea, dicyandiamide, biuret, guanylurea and guanidine were suggested for condensation with formaldehyde *(47)*.

It was found that by carrying out the condensation of urea and formaldehyde in acid or basic environment, the affinity obtained was respectively for basic and acid dyestuffs. For this purpose the acid medium in the condensation was tartaric acid and the basic one, triethanolamine *(48)*.

According to another process the affinity towards basic dyestuffs is conferred by treating the cellulosic material with solution of methylolurea and formaldehyde added to guanidine *(49)*.

Suggested also were the condensation products obtained from aromatic amines as toluidines and formaldehyde, or from the halogen-methylarylsulfamides and formaldehyde *(50)*; also the incorporation in the spinning mass of pyrrol, polyamines and formaldehyde *(51)*.

Another process consists in treating the fibers in a water solution containing formaldehyde and amines of at least eight C atoms, as stearylamine acetate or isopropyldodecylamine lactate. A curing at 90° C. follows the drying after the impregnation *(52)*.

A similar treatment can be carried out in a water solution of the product obtained by condensation of an aliphatic or cycloaliphatic amine of at least six C atoms, as tetradecylamine, an organic acid as glycolic acid, and paraformaldehyde *(53)*.

Among the urea derivatives, particularly suitable for the animalization process are cyanamide and its derivatives: dicyandiamide, guanidine, melamine, biguanide, etc.

The application of cyanamid derivatives to the spinning mass has been considered *(54)* also its use together with pyridinium compounds *(55)*.

Impregnation of rayon with condensation products of cyanamid-formaldehyde dissolved in organic acid *(56)* or condensation products obtained from cyanamid and acetaldehyde *(57)* can be utilized.

A new process consists in the treatment of rayon with a solution of cyanamid, hydroxyaldehyde or an aliphatic hydroxyketone in the presence of a catalyst, for example a solution containing 3% cyanamid, 3% aldol, 0.1% resorcinol and 0.1% sodium carbonate of a resulting pH of 8 *(58)*.

Pre-condensated cyanamid-formaldehyde resins can be added to the spinning mass together with condensation products of urea-aldehyde *(59)*.

Condensation products obtained from guanidine, dicyandiamide, biuret, and formaldehyde *(60)* are also useful for the animalization of glass fibers or of vinylic polymeric fibers *(61)*.

Other useful pre-condensates for the pre-treatment of rayon, can be those obtained from formaldehyde and biguanide *(62)* or from formaldehyde and diphenylbiguanid *(63)*; or the condensates obtained from dicyandiamide and formaldehyde in the presence of resorcinol *(64)*.

Other processes deal with the use of the products obtained from formaldehyde and guanidine compounds. Guanidinic derivatives, which are obtained from alkyl esters of aliphatic dicarboxylic acids, such as guanidine ethyloxalate can be used *(65)*. Other useful guanidine compounds are the guanidine salts of long chain carboxylic acids such as guanidine sebacate or adipate which added to a water solution of formaldehyde, serve to impregnate the textile materials *(66)*.

To a solution containing formaldehyde the guanidine salt of an unsaturated carboxylic acid such as guanidine metacrylate or cinnamate can be added *(67)*. Guanidine methacrylate:

is obtained by neutralization of guanidine

carbonate with a solution of metacrylic acid in ethanol.

Melamine can replace cyanamid in the manufacturing of the condensation products with formaldehyde, and be useful for animalization *(68)* and for fixation in printing *(69)*.

The practical use of synthetic resins derived from cyanamid has been achieved by Courtaulds in their commercial development of the fully animalized viscose staple Rayolanda WS, and probably similar synthetic resins have been used to animalize a German fiber Artilana, produced by the Schlutins A.G.

(E) Polymerization products

Particularly important are the reaction products of polymeric compounds with amines or derivatives or those obtained by means of saponification with amines or derivatives, of esters or halogenated esters of polymerized compounds.

Among others, the reaction products of amines with the acylated halogenic derivatives of polymerized synethtic polyoxyderivatives such as polyvinylchloride or acetate etc., partially saponified polyvinylic esters, the polymerization products of vinylic or divinylic ethers of aminohydroxyderivatives *(70)*.

It is, for example, suggested that addition to the viscose mass of the reaction product of polyvinylic alcohol and cyanogen bromide or bromoethylamine gives good results *(71)*.

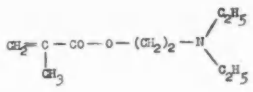
For a pre-treatment of rayon the water soluble compounds resulting by the action of halogenated derivatives of polyvinylic esters with tertiary amines, such as those formed by action of polyvinylchloroacetate and pyridine, can be used *(72)*.

A similar treatment of rayon is carried out by using the nitrogenous compounds formed by reaction of a polymeric amide soluble in water as the polymethacrylic amide, a non-aromatic amine, and an aldehyde in acid or alkaline bath, for example the product obtained from dimethylamine, acetic acid, formaldehyde and polymethacrylic amide, in a water solution *(73)*.

Acetate rayon can be animalized by addition to the mass of 10% of the basic resin obtained from the ethylic ester of polyacrylic acid and an equimolecular proportion of diethylaminoethylamine at 100-120° C. *(74)*.

A final operation which can be given to an acetate rayon animalized by this method, consists in rinsing in diluted acetic acid, drying and heating at 80° C. and 92% relative humidity, with vapors of epychlorohydrine for 15 hours. The animalization would be improved also as far as concerns the fastness of the dyeings *(75)*.

For the animalization of the synthetic fibers not containing N, compounds such as diethylaminoethanolmethacrylate:



are best *(76)*.

Other new polymeric compounds which may be added to the viscose, when used in the form of their acid salts are:

poly(hexamethylenguanidinebromohydrate)

poly(hexamethylenguanidine) *(77)*.

(3) Animalization by Means of Mixtures or Reaction Products of Protein Substances With N-(or S-) Containing Non Protein Substances

According to this concept the animalization is obtained by adding to the spinning solution protein substances combined or mixed with other organic substances.

One process consists in the addition to the viscose solution of albuminoid substances and nitrogenous condensation resins of the type already mentioned *(78)*. Gas generating agents can be added together with the animalizing compounds. The addition of these substances permits production of rayon of a tubular cross-section similar to the not animalized and well known German rayon HCS or Celta.

To the protein substance prior to addition to the spinning mass a sulfur-containing substance can be added, for example the mixture obtained from a solution of an alkaline polysulfide and a solution of chloral hydrate *(79)*.

A recent process utilizes the incorporation in viscose of the reaction product of casein with phenylisocyanate, solubilized in aniline *(80)*.

To the acetate mass alkyl aryl derivatives or protein substances or the de-acetylated products of chitin can be added *(81)*.

To the spinning viscose mass the complex products obtained by the action of ethylenimine on protein degradations, can be added *(82)*. Ammonia can also be used, though pyridine is not satisfactory.

Another process consists *(83)* in treating the staple hanks in a solution of ethylenimine and casein (ratio 3:1) and impregnating them afterwards in a phenylisocyanate solution in cyclohexanol. They are dried and cured for 1 hour at 80° C.

The reaction products obtained from casein, ethylenimine and phenylisocyanate, can also be emulsified in the viscose mass *(84)*. This type of animalization seems to have been applied in Vixtralan XT, produced by the I.G., which was the first rayon really animalized.

Vixtralan XT is a slightly mat viscose staple with a soft woolly feel and a yellowish grey-color.

It was produced in fiber of 80-85 mm. length, and 2-3 denier. Under the microscope it shows lack of dulling substances and a characteristic roughed surface, besides good curl. Its wettability is inferior to that of the normal viscose rayon, and it is more insulating. The tensile strength is of the order of Cisalfa.

The method of spinning of Vixtralan XT is probably similar to that of the German viscose staple Vixtra XT obtained by substitution of the sodium bisulfate of the normal coagulation bath (Mueller bath) with a neutral bath of ammonium sulfate which causes a round section.

According to an interesting study *(85)* the animalization of Vixtralan XT is obtained by incorporation into viscose of 8% casein and 2% of the condensation product obtained from ethylenimine and phenylisocyanate *(85)*.

The presence of casein is indicated by a percentage of P (calculated as P_2O_5) of the 0.0034% on the fiber, and by the presence of 8.13% on the fiber of protein substances insoluble in sulfuric acid. The fundamental animalizing compound is demonstrated by the presence in the distillate of the fiber from a 10% NaOH solution, of phenylethylurea (0.06%) considered to be a secondary product of the reaction.

According to recent information *(87)* Vixtralan XT has been animalized with 2-5% of a basic product of the Solidogen BSE type which is normally used to increase wet fastness of substantive dyeings. It is the methylation product of a base obtained by treating trichloroparaffin with Vulcacit, a polyethylenepolyamine *(88)*.

If the animalization of Vixtralan XT is carried out with this last basic compound it would probably correspond to an already mentioned process *(89)*.

Considerations

Animalized fibers acquire a degree of attraction toward acid dyes depending on many factors. The co-ordinate valences play their complex role in the absorption of acid dyes.

A good animalization, which indicates good affinity towards the acid dyestuffs depends on:

(1) the degree of basicity of the animalizing substance,

(2) its quantity,

(3) its degree of distribution in the body of the fiber.

A logical relativity has to be considered as far as concerns the chemical constitution of the acid dyestuffs used and the conditions of dyeing.

The degree of distribution of the animalizing substance is very important and consists of the molecular repartition in the amorphous spaces of the intermicellary zones of the fiber.

Albumin and casein show poor uni-

formity of repartition, beyond a certain percentage, because of their high molecular weight and the fact that they coagulate faster than cellulose and tend also to accumulate at the periphery of the fiber.

With insoluble substances added before spinning good distribution is also difficult to obtain. A bad repartition of the protein substance causes a decrease of the resistance of the fiber, greater than that obtainable with a good repartition. The repartition degree of the polycondensed compounds formed in the fiber after impregnation in their water soluble pre-condensates like that obtained with the lineary polymers applied in soluble form, is good.

These polymers if applied in emulsion form by means of an aftertreatment of rayon are only superficially deposited on the fiber, but if added (in the soluble or insoluble form) to the mass before spinning, could give origin to a steric consideration concerning the relation between the form of their molecule and the animalizing effect.

It would appear that in macromolecules greater attraction force is shown towards the dyeing anion if the nitrogenous chain is of only one dimension, as in the polymeric lineary resins, where consequently the nitrogen is not caught in a lattice as in the generally tridimensional molecules of the aminoplastics.

A more suitable adaptation would be a large flat molecule.

This has been already demonstrated in the field of substantive dyestuffs by means of polarization measurements of the diphenyl nuclei of benzidine *(90)* which are on the same plane if substituted in para and in different relation if substituted in the ortho position, and we see that the azoic dyestuffs derived from diamino-4-4′-benzidine dye cotton directly only if they have no substituting groups in ortho position.

Considering the moment in which the animalization has to be realized we may observe that the animalization by means of insoluble substances before spinning can cause difficulties in the extrusion.

In acetate rayon, considering that application after spinning is not convenient because of its difficult impregnation, the animalizing substances are added before spinning and must have a good degree of solubility. This property is difficult to find in the field of resins.

Treatments of fiber immediately before dyeing are not convenient for the dyer because of complicated procedure.

The water fastness of the animalization effect is important for the evident relation with the fastness of the shades obtainable. While the occlusion of the protein substances, if they are well distributed, is sufficiently resistant, even to light alkaline washings, the major objection to many products is that they are deposited on the outer surface of the fiber.

From the technological point of view the properties of the fibers are modified, particularly when wet, by the presence of protein substances.

As far as concerns the resins we know that usually there is a general decrease of the tensile strength, and contrary to proteins, also a decrease of the swelling power of fibers.

Other Effects

Simultaneously to the specific effect of animalization other effects can be conferred such as those obtainable with high molecular weight compounds with fatty hydrophobic radicals, with or without hydrophylic groups.

Softening is conferred, as is the case by molecules possessing fatty radicals favored by cationic activity, or by proteins.

The animalizing substances can give a dulling effect, though not as complete as that obtainable with TiO_2. Resins, if applied on the formed filaments, can give durable delustering effects.

Possibly a convenient method of flameproofing could be incorporated.

Aided by a convenient mechanical treatment the application of synthetic resins can confer a permanent wave to the fibers or, as can also happen with other compounds, formation of a roughened surface which simulates the scales of wool. This last effect can result in antislipping and consequently confer better stability to the cloth.

Dyeing and Finishing Animalized Fibers

As we have seen, the faculty to dye with the acid dyestuffs depends upon the quantity, quality and distribution degree of the animalizing substance in the fiber and other factors.

The fibers animalized with only 4-5% of protein substances have tinctorially effects similar to those of cotton, although they reach deeper intensity. The more convenient dyestuffs are those ordinarily used for cellulosic fibers. The fastness properties do not change.

The affinity towards acid dyestuffs is limited but sufficient, if the dyestuffs are properly chosen.

The dyeing of the animalized fibers on the market does not give perfect results but their versatility is often an important factor.

The acid dyestuffs which dye from a neutral bath are more suitable than those which need a strong acid bath.

On the negative side is the poor leveling of dyeings and poor fastness. Eckert, Herr and Fisher *(91)* have studied the absorption of acid dyestuffs by animalized fibers, for the purpose of determining the dependence existing between the affinity of the fiber, the pH value of the bath, the time and the quantity of dye stuffs employed. They found that, as for wool, when the pH decreases the quantity of the absorbed dyestuffs increases, the maximum of absorption being reached at pH= 2 (1.3 with wool). With a bath ratio of 1:25 and a pH which may stay under 2.5 the maximum of absorption of the dyestuffs is obtained. These observations can vary, of course, according to the different types of animalized rayons, and it is observable that the low pH cannot but cause trouble to the cellulosic fiber.

It has been found *(92)* in the dyeing of mixed fabrics of wool and animalized cellulosic fibers such as Rayolanda, using metallized dyestuffs of the Palatine Fast or Neolan types, that a more intense shade can be obtained on the animalized fiber by adding tannic acid to the dye bath.

Better dyeing with chrome dyestuffs of fibers animalized with saponification products of polymeric vinylic derivatives *(93)* can be obtained if carried out in a pyridine bath.

MacFarlane *(94)* has dealt with the dyeing and printing of fabrics made with Rayolanda, observing that they can be submitted to discharge and give good effects superior to wool.

Bleaching with hypochlorite destroys the animalization of this type of rayon.

Artilana has affinity for the milling fast types of acid dyestuffs but slightly inferior to that of Rayolanda. To dye a mixed cloth of Artilana and cotton it is advisable *(95)* to use metachrome dyestuffs and to add after boiling, 30% of Glauber's salt, lowering the temperature to 80° C. and continuing for half an hour. Fast shades can be obtained by dyeing in two-baths: first with sulfur dyes in the presence of sodium bicarbonate then with chrome dyestuffs. For pastel shades the Indigosols or Algosols applied by padding and vaporizing, are suggested.

For Railan, animalized with a high percentage of casein, the bleaching method considered most satisfactory is that carried out with sodium permanganate in an acid bath. In the wet operations this type of fiber must always be delicately treated. Before dyeing, a light washing with a 5 gr./liter soap solution at 45° C. for 30 min. is advisable. Alkaline treatment and chlorine-containing liquids must be avoided with Railan. An advantage however, of this fiber in comparison with acetate rayon, is that it can be strongly twisted giving the possibility of good crepe effects.

The fastness properties remain the most objectionable feature in dyeing animalized fibers.

(Concluded on Page 882)

Proceedings of the
American Association of Textile Chemists and Colorists

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December 27, 1948

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NEW BEDFORD TEXTILE INSTITUTE
GEORGIA SCHOOL OF TECHNOLOGY
CLEMSON COLLEGE
BRADFORD DURFEE TECHNICAL INSTITUTE

Western New England Section to Meet Jan. 14th in Shelton, Conn.

THE next meeting of the Western New England Section will be held on Friday evening, January 14th, at Rapp's Restaurant, Shelton, Connecticut. Dinner will be served promptly at 7:00 P.M. and dinner reservations may be made with Robert N. Brownlee, U. S. Rubber Company, Naugatuck, Conn.

Dr. H. F. Marks, Professor of Organic Chemistry at the Polytechnic Institute of Brooklyn, will speak on "High Polymers." Dr. Marks was a professor of chemistry in Vienna from 1932 to 1938 and has been at Brooklyn since 1940. His main interest has been in the chemistry of high polymers, particularly cellulose, but also rubber and plastics.

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Meeting, Pacific Coast Section

THE Oregon and Washington members of the Pacific Coast Section held a dinner and meeting on Nov. 19, 1948 in the Multnomah Hotel, Portland, Oregon. A. H. McKenzie of the Portland Woolen Mills presided.

The speaker was Dr. Arthur F. Scott, head of the chemistry department of Reed College, Portland, Oregon, on subjects related to atomic energy.

The enthusiastic response of AATCC members in the Pacific Northwest speaks well for the future growth of the organization.

Respectfully submitted,
H. A. DesMARIS, *Secretary*

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1949 Meeting Dates, Philadelphia Section

MEETINGS of the Philadelphia Section will be held as follows during 1949:

January 28—Kugler's Restaurant, Philadelphia.

March 11—Kugler's Restaurant, Philadelphia.

April 15—Kugler's Restaurant, Philadelphia.

May 20—Kugler's Restaurant, Philadelphia.

June 10—Outing—Place to be selected.

September 16—Kugler's Restaurant, Philadelphia.

October 13-15—National Convention, Chalfonte-Haddon Hall, Atlantic City.

November 11—Kugler's Restaurant, Philadelphia.

January 20, 1950—Kugler's Restaurant, Philadelphia.

Hudson-Mohawk Section

THE first official meeting of the Hudson-Mohawk Section was held on November 19, 1948 at Jack's Restaurant, Albany, New York. Dr. Jack Epelberg, *secretary pro tem,* conducted the meeting. Eighty-five members and guests were present for the dinner and eighty-eight for the meeting.

The following men were elected to the offices listed:

Chairman—Dr. Jack Epelberg, Assistant Director in Charge, Chemical Process Research, Cluett-Peabody and Company, Inc., Troy, New York.

Vice-Chairman—David O. Hamer, Jr., Technical Sales and Service, Arkansas Company, Inc.

Treasurer—Irwin J. Smith, President and General Manager, Surpass Chemical Company, Inc., Albany, New York.

Secretary—William A. Nelson, Chief Chemist, Ritter Chemical Company, Inc., Amsterdam, New York.

National Councilor—Albert E. Herrmann, Jr. Manager, Standardization Laboratory, General Aniline Works, Rensselaer, New York.

Chairman of Intersectional Contest Paper—Harold S. Dahlberg, Laboratory Director, F. C. Huyck and Sons, Albany, New York.

The technical program consisted of a paper by Lawrence S. Thompson, Technical Demonstrator, General Dyestuff Corporation, entitled "Changing Aspects in Dyeing and Finishing".

Respectfully submitted,
WILLIAM A. NELSON, *Secretary*

DUES AND MEMBERSHIP CARDS

Personal membership renewals in October and November have been acknowledged with membership cards.

Subsequent payments will be so acknowledged within two weeks of their receipt.

If you fail to receive your card, please notify

Dr. H. C. Chapin
Secretary, AATCC
Box 28
Lowell, Massachusetts

CALENDAR

WESTERN NEW ENGLAND SECTION

Meetings: January 14, 1949, February 25, April 8, May 20.

NEW YORK SECTION

Meetings: January 28, 1949, March 4, April 1, May 6.

Outing: June 17.

PHILADELPHIA SECTION

Meetings: January 28, 1949, March 11, April 15, May 20, September 16, November 11 (Kugler's, Philadelphia).

Outing: June 10.

COUNCIL

Meetings: January 28, March 25, 1949 (Hotel New Yorker, New York).

RESEARCH COMMITTEE

Meetings: January 28, March 25, 1949 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS

1949: October 13 to 15, Chalfonte-Haddon Hall, Atantic City.

1950: October 19 to 21, Statler, Boston.

EMPLOYMENT REGISTER

This column is open for four insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

48-19

Education: B.S. in textile chemistry and dyeing, N. C. State College.

Experience: Direction of textile testing and development, with some teaching.

Age 29; married; references; U. S. west coast preferred.

12-27, 1-10, 1-24, 2-7

48-22

Education: High school with night courses in textile school.

Experience: Boss dyer, with general experience, particularly wool and rugs.

Age 49; widower; references; will go anywhere in U. S. or Canada.

12-13, 12-27, 1-10, 1-24

48-23

Education: B.S., University of Bombay; M.S. expected from Lowell Textile Institute, January, 1949.

Experience: Chemist and director of dyeing, India.

Age 33; married; will go anywhere.

12-13, 12-27, 1-10, 1-24

Dinner Honoring Corporate and Charter Members—

AATCC CONTRIBUTIONS TO INDUSTRY*

HENRY F. HERRMANN, President

MY talk tonight—brief though it is—will be divided into three parts:

#1—The amenities.
#2—Out of the window.
#3—Just among ourselves.

Webster defines amenities as "the pleasant features of anything." What could be more appropriate in this instance than to linger a few moments to contemplate the pleasures we are enjoying and to anticipate those still to come. This appreciation carries with it a sense of gratitude to those whose forethought, self-sacrifice and downright labor have made this convention possible and have sown the seed for an event of considerable importance. To you, our tri-Section hosts who constitute the Southern phase of AATCC's domain, we express our sincere thanks for having invited us and for the many evidences of your careful planning to make our visit a memorable one.

Your effort to show us the hospitality of the South is complemented by our technical program, much of which is intended to show the new industrial South at work and how we as individuals, and more so as an association, can be of assistance to you.

Next we come to the sub-title "Out of the window." By this I mean that my remarks, heard only by this present audience and comprising much which is "old stuff" for good AATCC members, are largely intended for the absent audience which knows little or less about us and will judge us by what is written in the record.

During World War I our country was forcibly drawn out of its chosen shelter of isolation from world affairs. It was driven to a recognition that the independence which the liberty forces of '76 fought and died for was a sham and delusion, unless it was coupled with independence in the material things of life. Great strides were made in the advancement of science and industry in the U. S. A. prior to 1914, but it took World War I to shake the sleep out of the eyes of the great industrial giant who was slumbering for many years. We do not need a recital of statistics to prove to you the birth of the chemical industry and its phenomenal growth in this country during the years that we may proudly call our generation. For the U. S. A. it may well be referred to as the Chemical Age but in so doing I do not wish to imply any innuendo of completeness. Far from it. We are standing on the threshold of developments beyond the dreams of man; some in pilot plants, others in test tubes —possibly the greatest still in the cerebral matter of some obscure research worker.

When our chemical industry declared its independence from foreign domination it followed logically that the American textile chemists should band together to form our association so that the American textile industry would be led from within, instead of by European bodies, which, no matter how scientifically eligible they might be, are not especially concerned over our welfare. Twenty-seven years ago our Charter Members assembled to form the AATCC. Although the preamble of our constitution says not a word about freedom, nevertheless, it spells a new declaration of independence —this time not from one country but from the entire world for our chemical and textile industries.

These may sound like extravagant phrases attuned to the tempo of our concurrent political campaign. I assure you that this is not idle rhetoric but sound facts. Our industries cannot be independent if the quality standards on which they depend for self-regulation are dictated by outside interests. The AATCC is the workshop of these American industries—it is their voice to protest or to applaud—it is the common ground on which all factors can meet and work in unison for the common good. It is one of the few phases of co-operation between competitive interests on which our government must radiate a benign smile of approval. Reforms which our individual companies cannot effect by themselves, no matter how powerful they may be, can be promoted by our association providing they fall within the limits of our avowed scope of activity.

The terms S A E 30, 20 and 40 are familiar to every motorist as designating the viscosity of lubricating oils. They mean the same, regardless of the city or state in which the purchase is made or the identity of the distributor or manufacturer. I cite this as a simple, well known example of standardization which benefits all parties from the producer to the consumer and eliminates a welter of confusion based on misinformation. How was this accomplished? The Society of Automotive Engineers, a body similar to our association, worked out these useful viscosity standards and persudaded the oil refineries to adopt them. The rest was easy. However, hidden in each modern automobile are many similar examples of standardization of inter-changeable parts with which the public is not acquainted. Of such importance to the industry are they that present manufacturing and procurement methods would be impossible without them. No individual automotive manufacturer could have brought this standardization about—nor any localized group of manufacturers. But it was easy when they all worked together, through their engineering society! Stop and consider for a moment an industry fraught with commercial rivalries, jealousies and suspicions, demonstrating its capacity to work hand in hand on matters of mutual benefit to all members.

This parallels the AATCC case very closely. The standards we work out for universal use cost our supporting members a trifling sum. Any one company attempting to do this service for itself would spend a fortune in comparison. And mind you—one single advertisement to promote a company's claims costs several times as much as the largest annual contribution we receive from our most generous corporate member.

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* Presented at Dinner Honoring Corporate and Charter Members, Augusta National Convention, October 21, 1948.

Dinner Honoring Corporate and Charter Members—

THE IMPORTANCE OF CO-OPERATIVE RESEARCH*

J. ROBERT BONNAR
Chairman, Executive Committee on Research
Chairman, General Research Committee

I AM very pleased to have the chance to talk to you as Corporate Members rather than as regular active AATCC members tonight, because I feel the money we are spending is being spent to good advantage to you and the textile industry, and it is due you that you be told the fine work that is coming from the expenditure of your money.

You will have the chance to read this in the *Dyestuff Reporter* if you have the time, but as executives you probably don't read in detail the various committee and sub-committee reports which are available to you. We have at the present time twenty-three tentative tests which are in good working order and which are available for use by the industry. These will either be polished up some more with slight changes, or be made standard tests very shortly.

When added to the nineteen standard tests already set up, you can readily see that there will be a sizable number of methods available. At the present time working on these problems as well as others are twenty-three active committees; in addition to which there are eleven more fastness tests now being investigated and working committees being set up.

To the best of our knowledge within the Executive Committee on Research for whom I am speaking, as well as the General Research Committee, every test method which would be of use to the textile industry has been, is now, or will be shortly, under investigation. You can readily realize that without these tests any attempt toward fast color labeling, either compulsory or voluntary, or general testing of quality covering mostly color fastness, would be pretty chaotic. You must without doubt realize that should your dyer not keep a standard swatch of shade, let us say, #278, but only keep a working formula, regardless of how careful he might be in weighing out, dyeing, etc., he could not hit your standard of #278 merely by use of the formula. The same would certainly be true if your dyer made a wash test to insure satisfaction of his dyeings at 150° F. for a half hour, when the converter's commercial laboratory test was done at 120° F. for thirty minutes as against perhaps a large chain store laboratory test being made at 180° F. for an hour. To bring it even more forcefully to mind, the woolen trade is fast being overtaken with non-shrinking materials, and there must naturally be some yardstick for your mill to work with in order to insure that the goods produced by you are satisfactory according to certain standards decided upon through a series of testings and pilot plant work which must be based for quality control on standard methods of test.

In addition to standard methods of test, your AATCC support is being used for general problems which are definitely of much interest to you. One very interesting example is that of the stainless steel equipment investigation which is at the present time just being undertaken by the association. It has been called to our attention by many people that their stainless steel equipment does not seem to last for the ten or more years that it should last, based on the price and the knowledge of stainless steel as such. We want it clear that we do not intend at any time to specify any one company's stainless steel, but merely to bring out in the open through investigation what the troubles are. Then, based on an accumulation of data, the manufacturers of textile machinery for wet processing will be called to a meeting, with perhaps the manufacturers of the stainless steel at the same time, with the idea that an outline of future work, as it can be seen is needed from the data, will be put into process.

We have within the last year or two set up firstly, advisory research committees in each of the sections of the association, and these committees are well under way and undertaking various problems of interest to you and the entire industry. They have already submitted several literature surveys on subjects of common interest; these are of inestimable value for your chemist or technician whereby an entire coverage of the literature on any one subject is available to them in one place without necessitating and making a time-consuming survey of their own.

We have just finished what we call the "OD #7 Project" for the Quartermaster, and whereas we all pray that this information will not be needed as a war service, when released as public information it will give many aids and hints as to how quality goods should be processed, and will insure large production combined with satisfactory quality, should the armed forces need material as they did during the last war.

Even though the Corporate Membership dues are not used directly for articles in the *Dyestuff Reporter*, nevertheless indirectly your Corporate Membership dues result in many fine papers. This comes about because of the fact that your money is used to aid the various investigating committees in which we have young men who are trained in the methods of investigation of a problem. They are, thus, firstly, trained in tackling problems which are of benefit to you, and they secondly, become interested in reading the *Dyestuff Reporter* which unconsciously trains them to think out their own problems more efficiently.

I further would like to point out to you the fact that through our various investigations we have become known to outside allied associations such as the National Association of Insecticide and Disinfectant Manufacturers, the American Society for Testing Materials, Glycerine Manufacturers Association, Laundry Institute, Home Laundry Machinery Manufacturers, The Rubber Association, the Society of Plastics Industries, Textile Research Institute, etc. These associations would no doubt many times set up fast-

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* Presented at Dinner Honoring Corporate and Charter Members, Augusta National Convention, October 21, 1948.

Annual Banquet—

PRESIDENT'S ADDRESS*

HENRY F. HERRMANN, President

TWO years ago when our association celebrated its Silver Anniversary I was asked to make a statement as its then president-elect, and in preparing it, it was with considerable trepidation that I reviewed the fine work done by my distinguished predecessors in this office. Such thoughts could lead to only one determination—namely, to make good the promise to promote the growth of the AATCC. As we stood on the threshold of our second twenty-five year career, the achievements of the founders and their co-workers were a challenge to build where they left off. In this spirit I accepted the mandate to start the association on its second quarter century lap.

It is fitting that I review some of the more notable occurrences of these two years. Numerically, we have grown from less than 5,000 to nearly 6,000 individual members. Our corporate membership has held its own and if our hopes are realized the present drive should raise the research fund obtained solely from this source at least 50%. Our sections have increased from 8 to 11.

We tested our growing strength by holding two conventions in cities which demanded a considerable amount of traveling by the majority of those who attended. This was done at some risk of failure because of the deterrents of time and expense. Nevertheless, both meetings were successful. I refer to last year's convention in Chicago and the present meeting in Augusta. The misgivings of the sponsoring Sections were genuine and the financial risks they faced could be more material than fancied. Why then were they successful as this meeting assuredly is? Because of faith—faith in an ideal—confidence in the camaraderie which our association has engendered.

After so many talks on the same subject, I hope that whatever more I say about our association will not be misunderstood as a defense tactic. Too often well intentioned explanations miss fire and raise the very doubts they are meant to dispell. However, we meet only once a year and by my office it is my duty to be your spokesman. What I fail to say about our association—its growth, its aspirations and its accomplishments may remain unsaid. In consequence many who have little or no opportunity to know the inner workings of the AATCC, might leave Augusta with little more reaction than that they had a wonderful time.

You would not have met here except for the AATCC. Our Southern sections would not have had any reason to invite you except for the serious side of this Convention—I am certain that many less visitors would have responded to a simple invitation to participate in the relaxation features of this meeting. Your attendance here, the sacrifices made by our hosts to make this Convention possible, and the success of the affair indicate deep rooted values which I wish to hold up for inspection and analysis.

The creation of the AATCC some 27 years ago was an experiment. Its slow growth for several years was mostly due to the loyalty of the founding charter members. The young association had ideals but was seeking the power of self expression—how to transform into reality the objects listed in its constitution:—

"To promote increase of knowledge of the application of dyes and chemicals in the Textile Industry.

"To encourage in any particular way research work or chemical processes and materials of importance to the Textile Industry.

"To establish for the members, channels by which the interchange of professional knowledge among them may be increased."

How closely have we adhered to these principles? There can be no question about the first and third assignments. Our 50 odd sectional meetings per year bring together accumulatively thousands of textile technicians who present or hear the latest developments of the industry. Nothing which is new and important can long escape publicity in these meetings and written recording in our *Proceedings*. It follows that our members are kept abreast of the times and benefit from a life-long extension course in practical and technical education.

Our Olney medalist, Harold M. Chase, told us last Thursday night that schools can impart to students only that which is recorded in the text books by which they are taught. They graduate with heads crammed full of a bewildering mass of unrelated facts. They are then eligible for adult education in the chosen field of their profession. When the young man finds employment, he will be preoccupied for a year or two in finding his feet in practical work. However, there is a danger that he may so overrate his newly acquired experience as to lose interest in further studies and scientific readings. If this is permitted to continue for any length of time, he will find himself a victim of parochialism. He may know a lot about very little and his mentality and experience will be circumscribed by the four walls of the mill which employs him and his immediate environment. Management may change, new developments may occur or anything else to disturb the even tenor of his life. They find him unprepared to adjust himself quickly and though young, he may be relegated to the reactionaries or "has beens."

No one can dispute that our association supplies the answer to this situation. It is an educational medium that not only keeps textile technicians abreast of the latest developments, but through its research committees invites them to do original work in company with enterprising and qualified fellow members thereby forging ahead of published knowledge. What better means is there for a young technician to emerge from obscurity than to rise thru the ranks of our research structure? An invitation to him to present a paper before the AATCC assembled in National Convention is an honor he will long remember and which

(Continued on Page P877)

* Presented at Annual Banquet, Augusta National Convention, October 23, 1948.

Printing Group Meeting—

TEXTILE PRINTING TECHNIQUES*

FRANCIS S. RICHARDSON

Waldrich Bleachery

THE beginnings of the art of ornamenting textile fabrics by stamping or printing of colored designs are lost in antiquity. They are usually assumed to have originated in the Far East where both Hindus and Chinese are known to have practiced hand printing with wood blocks from the earliest times. Textile printing was also practiced by the ancient Egyptians and the Peruvians. The Art spread westward, from India or China—we are not sure which, till it reached Europe, where it was practiced throughout Holland, France, Germany, Spain and England. Most of this work was block printed and it remained so until 1783, when a Scotchman named Bell invented the roller printing machine. Basically Bell's invention was sound. While there have been improvements and additions, the machine as he conceived it is essentially the same as we have today. The final impetus which made the printing of textiles a diversified and volume enterprise was, of course, the discovery of coal-tar dyes by Perkins. This widened the field until it has become the complex, many-sided problem we know today.

Innovations and inventions developed around the conventional print machine have been many, a notable one being the duplex printing machine which, as you know, makes it possible to print both sides of a fabric at the same time, either with the same pattern or two different patterns. Another is the use of a rubber covered main cylinder, which makes it possible to dispense with lapping and blanket. This type is most commonly used as a one or two color machine. Attachments have been put on print machines making it possible to disengage a roller after it has printed part of a pattern, and to re-engage it in its proper place. Table cloth designs are often roller printed by this method.

The high speed printing machine developed in this country is another notable engineering achievement based on Bell's original idea.

Various methods of engraving print rolls have given large scope to type, style and variety of designs reproduced. Development of photo-engraving has made it possible to print intricate designs possessing a wealth of detail and shading, not in many cases photographs, but photographic in their detail.

Since the discovery of photography there has been a desire, from time to time, to reproduce photographs on fabrics. "If it can be done on paper, why can't it be done on cloth?" has been asked many times. Several attempts at this have been tried. The order in which I shall discuss them does not indicate their age, but rather the order in which I have come to know them.

When the soluble vats, the sulfuric acid esters of the vat leuco, were first produced, it was quite evident that they were sensitive to light. It was therefore natural for someone to sensitize a piece of cloth with such a dye, expose it under a negative to sunlight or some other source of ultra-violet light and obtain a picture on the fabric. The procedure is patented; in fact there is a very good patent covering it, held by the Agfa Ansco Corporation.

Experimental work by this method has produced some very pleasing effects. Repeats of pattern can be made, 4 feet wide and up to 16 feet long. Drapery length repeats of 9 feet in unusual patterns can be produced. The resulting prints are quite fast corresponding with the vats from which the dyes were made. They are, however, usually single color, or they may be 2-color in that a pattern printed, say in brown, can be dyed in some contrasting shade such as pale yellow or light green, thus giving a brown object on a colored ground. The range and depth of colors obtainable are limited. It is not possible to obtain black, and other shades have a soft look to them; they lack depth. It is difficult to match colors in that there is a limit to the depth of shade that can be produced. In matching a wine, for instance, if it comes up too blue, the shade cannot be corrected by simply adding red. The resulting print will show the increase of red only if some of the blue has been removed. To match shades small quantities of dye solution are made up and tested. If too far off, they have to be discarded and fresh ones tried. Once a formula has been established, a good match of the shade or color can be reproduced.

The second method of reproducing photographs on cloth is by sensitizing the fabric with a base, exposing it with an intervening positive or transparency and subsequently developing it. Where the cloth has been exposed to light, the base is so affected that it will not couple, and the color will not develop. This method produces sharper prints than the one previously discussed, but has definite limitations in range of shades obtainable, and fastness properties, particularly to sunlight.

A method of printing fabrics which has been known some time and has recently received publicity in this country in a textile publication, is offset printing, using much the same type of equipment and procedure as on paper. The method described as in use in this country is from plates fixed to different size cylinders, depending on the size of the repeat, and is used for production of such things as table cloths, bridge cloths and napkins. Apparently there is no attempt to print patterns continuous in nature, which involve the use of engraved cylinders or rollers. This type of textile printing has been tried in Europe for at least 20 years, and some very intertesting results obtained. It is obvious that great latitude as to the number of colors in any given part of a design is easily available. In recent months a representative from Switzerland has been in the United States attempting to interest American printers, in a machine suitable for the work.

Basically, the machine consists of four rollers, one for each of the three primary colors, red, yellow and blue, and one for either black or brown used as a shading or outline color. As can be done with

* Presented at Printing Group Meeting, Augusta National Convention, October 22, 1948.

paper, color separation photographs are made and the rollers engraved accordingly. Thus anything that can be photographed can be reproduced in the same color as the photograph, or in any desired mixture of colors that might lend itself to the design. To date the most successful work has been done with water-free print paste. The regular printing pigments are made up in a water-free medium and produce excellent results. This has been difficult to attain, as pigment and water-free paste alone would not, of course, produce any degree of fastness with color simply deposited and dried on the fabric. They had to incorporate some type of bonding agent. This was done, but the colors still have a decided tendency to crock, and end use of fabrics printed in this manner is therefore limited. It is claimed that yardage has been produced for drapery purposes, using pigments.

Experimentally, and possibly in full scale operation, additional work has been done with vats. The vat pigment is applied to cloth in a water-free medium and subsequently wet developed. This is a variation of the well-known Colloresin process, the main difference being the gum or print paste involved.

Printing dyed grounds with dischargeable patterns is apparently the farthest from success, and conceivably may never be satisfactory.

The engraving of the rolls is of necessity shallow. It has been said that in starting this process it would be necessary to have an engraver familiar with offset plates and rollers in the paper industry. This very shallow engraving has a drawback in that the amount of color deposited on the fabric is very small. In loosely woven goods the printing appears defective, for as the fibers move or turn, they bring to the surface unprinted parts of threads.

Of course the main problem in this method is keeping the pattern in register or in fit, and to date all colth must be fastened to paper by some means. This was mentioned in the recently published article, and it is reportedly true of the work being done in Europe.

All photographic methods for reproducing patterns and designs have decided drawbacks or limitations. In some instances it is possible to produce a print obtainable in no other way, but the use of such is generally so limited that not enough yardage is involved to make operation profitable. Often slight change in design would permit printing the pattern on a regular machine with photoengraved rollers.

A weak point in any photographic process on fabric is the very fact that reproduction is photographic. We do not want photographs, we want designs in most textile ornamentation. Draperies should blend with other furnishings, not be eye pullers that detract rather than add to general decorative effect.

Dress design does not flatter the wearer if it is so conspicuous that the style of the garment is lost and overlooked. Frank Sinatra's picture on a pillow top may be interesting in a national picture magazine, but is not suitably designed pillow ornamentation which would fit in your home and mine and be produced in yardage. Photographic styling can be artistic, suitable for specific end uses and involve substantial yardage. Such work has been done, and undoubtedly will be done again. The type of reproduction possible by the offset method spans both photographic printing and conventional roller printing, but as previously stated, is limited by technical problems and the surface nature of the print in many instances.

Another method of printing, successful in a limited way, is the Swiss "Orbiss" process. This involves building up a print roll of color and gum in a pre-determined pattern. When the roll is run against fabric the pattern is transferred and the size of the roller gradually reduced. The yardage that can be printed is limited by the size of the roll, usually in the neighborhood of several hundred yards. Exact reproduction of pattern is not obtainable, although it is possible to nearly duplicate designs. A variation of this process is practiced in England, where there is reason to believe the built-up roll is combined in printing with conventional rollers to produce unusual variations.

The printing of fabrics with marblized patterns has been accomplished by a flotation process bearing the name of its developer, Sallada. This is accomplished by dispersing colors in a medium which will float on an aqueous paste, disturbing the color with rakes or stirrers to produce swirls and other configurations, and bringing the cloth in contact with the surface of this bath, thus transferring color to the fabric. Pigments have been used successfully in this process, as have also naphthols.

The design may be reproduced repeatedly on any length of material and at any time. Several special machines to do this work have been built and used.

There are a number of other methods for printing fabrics by machine. Some have never gone beyond the experimental stage, others are in highly specialized fields not necessarily of a decorative nature.

Screen, block, spray and other methods of printing are all being practiced today with some very interesting developments, but it is not the purpose of this paper to discuss them.

A specific method of roller printing, known for some time, is the Colloresine Process of printing vats. As many of you know, the vat pigment and a suitable print gum are printed on the fabric and dried. The cloth is then padded with a solution of alkali and hydrosulfite and aged. The nature of the gum is of course the basic factor which makes the process possible. The Colloresine being cold water soluble, and rendered insoluble in the atmosphere of the ager, works very well. Locust bean gum, being insoluble in an alkaline solution, also is suitable for this type of work.

The advantages of this method of printing vats in blotch patterns are many. Color shop problems are reduced; gum is used with no chemical to complicate the picture. Goods printed one day may be kept without any of the usual risks of heating up, etc., that attend cloth printed with hydro-containing pastes. Aniline black may be printed with the vats. The fabric is given a fast run through the ager before being chemically padded, and aged to reduce the vats. Most important of all is the fact that many vats, particularly in the fast-to-light group, may be printed in this manner when it is impossible to run them in the conventional manner.

This process is being used successfully in England, where they set up the chemical pad in front of a Mather and Platt pole or festoon type of ager. This makes an ideal set-up in that the sticks in the ager are in contact with the back of the goods, and the length of time can be varied considerably. Several screen print plants in this country are using this method to obtain very brilliant shades that are fast. They use a tower or chimney ager which, while very slow, tends to improve yield of color and give added brightness. With increasing demand for fast colors, and constant pressure on the part of stylists for bright shades, there would seem to be a definite field for this well-known printing method.

Though standard methods of printing have been in use for many years, it would seem that no innovation has yet come along that can universally take the place of the printing machine invented by Bell; but there is always the possibility that the inventiveness of man will produce a radical change in this field, as it has in others.

Members should notify the National Secretary of all address changes

General Technical Meeting—Cotton Symposium—

COTTON PLANS A RESEARCH PROGRAM*

LEONARD SMITH

Director of Utilization Research, National Cotton Council

TWO years ago in August the Congress of the United States enacted into law the Agricultural Research and Marketing Act of 1946. To implement the Act, Congress allowed an appropriation of $9,000,000 for the fiscal year 1948, and an appropriation of $13,850,000 for the fiscal year 1949.

What is it to you? Well, if you represent a cotton textile mill, a textile finisher or supplier of textile chemicals, it means that you should expect to have available a continually increasing store of research knowledge which you can apply to your own particular needs. If you represent the rayon industry it means that your chief competitor is taking a leaf out of your own book, is applying the research technique to its chief problems, and accordingly you should expect cotton to become progressively better and cheaper and more competitive in every way in future years.

There is a story behind this research program for cotton, one which I would like to sketch for you.

Back in the late thirty's, cotton was seriously concerned about its future. About 11 million bales were stored in government warehouses; competitive products—paper, rayon and other synthetics—were cutting sharply into markets held predominantly by cotton; and it seemed that the continuous reduction in the cost of these industrial products would never stop. Thus, for example, while rayon consumption amounted to less than 1% of cotton consumption in 1922, it had increased to nearly 21% of cotton consumption by 1947. In the meanwhile the price of rayon, $3.00 per pound in 1922, had dropped to $.25 per pound by September 1937. How was this possible? One obvious answer lies in the rapid expansion of the research programs of the rayon producers. Table I gives a measure of this expansion by showing the expansion in scientific research personnel of three of the top rayon producers.

TABLE I

Reported Scientific Research Personnel of Three Rayon Companies

	1931	1933	1937	1940	1946
Company I ..	70	70	338	424	541
Company II ..	9	9	15	39	110
Company III .	13	22	18	19	80

Cotton, watching the expansion of competitors into cotton's markets, realized that one of the factors which placed it at a disadvantage was the lack of integrated effort on its behalf.

In the face of the competition from industrial products the cotton interests, which are characterized by large numbers of small operators, decided to join together to form one association to represent and speak for the entire cotton trade. This was the birth of the National Cotton Council, which is supported financially by the vast majority of the cotton farmers, the cotton ginners, the cotton warehousemen and compressmen, the raw cotton merchants, the cotton spinners, and the cottonseed crushers.

Cotton recognized at an early date the important advantage to competitors of their vigorous, highly integrated research programs, and resolved to develop a program of its own. However, there are more than 1½ million cotton farms in the United States scattered across 18 states. More than 50% of these farms produce less than 4 bales of cotton each year. The large number of individuals comprising the cotton trade, the vast area over which they were located, their general lack of understanding of research organization, problems and techniques, all make it impractical to finance an adequate cotton research program by the trade itself. Consequently, our leaders concluded that their best immediate chance to obtain a substantially increased research program would be to seek the assistance of the federal government, a move for which there was a considerable precedent. The federal government has always recognized as its obligation the performance of important functions which the people cannot perform for themselves. As a matter of fact, the government has conducted cotton research for years. It was now to be asked to make its program an adequate one. There are other considerations which justify increased federal research aid: the great importance of the cotton industry to the nation's economy, the necessity of improving cotton in the interest of the military strength of the nation, and the plain economic wisdom of making this tremendous national asset a strongly competitive commodity.

The original plan was to request Congress to pass a cotton research bill. However, while cotton probably suffers more than any other agricultural commodity from lack of adequate research, agriculture as a whole feels the same need. Accordingly, the plan was changed and the bill which was finally introduced in Congress was a bill "to assure agriculture a position in research equal to that of industry".

In operation the Research and Marketing Act has a concept which makes it different from any farm legislation heretofore enacted; that is a concept of cooperation between government and private enterprise in the effective prosecution of the research program. This concept is apparent in two features of the bill. First, it provided that a National Advisory Committee of outstanding agricultural leaders would be established to aid the Secretary of Agriculture in formulating his program, and for the appointment of such other advisory committees as might be considered desirable. Second, the Act provides for research through contracts with public and private laboratories. This practice has been used effectively by the War and Navy Departments, and is expected to be equally effective for agriculture.

With particular reference to cotton, there was appointed a Cotton Advisory Committtee, which is composed of some of the best minds in the entire cotton fraternity. These men have established a Technical Advisory Committee to assist them in order that they might have the counsel of scientists and economists who

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are thoroughly familiar with cotton technology and cotton needs. A comprehensive research program has been developed which includes, we believe, all or nearly all of cotton's really significant research problems.

Now, on what basis does this research program rest? After all, one cannot simply walk into a laboratory and do research. It is necessary to determine what the research problems are and to evaluate their relative importance. The research division of the Cotton Council has devoted a major part of its effort for the better part of three years to this task.

In determining where research is most needed, the obvious first step is to learn which are the most important uses. The Council's Market Research Department has determined how much cotton goes into each end use, and whether consumption of cotton is increasing or decreasing in each. In addition, competent market investigators have made a continuing survey of hundreds of department stores and retail outlets, converters, fabricators and finishers, in order to learn what cotton's customers think are the important needed improvements.

Similarly, technically trained men have made surveys of particular cotton-consuming industries in order better to define our research problems. Their findings have been published in such reports as "Cotton in Plastic Laminates", "Cotton in Coated Fabrics", and "Cotton and the Carpet Industry". At the present time we also are conducting quality studies dealing with improvement of cotton's crease resistance, luster, draping quality, and soiling resistance. These studies attempt to assess the current state of the art, to review the methods tried and the extent to which they have been successful, and to suggest additional lines of work which might result in significant advances. We have visited as many as possible of the textile research laboratories, seeking the benefit of the best research minds in the industry with regard to problems of research which should be investigated.

From all of this work we have developed in cooperation with the staff of the Southern Regional Research Laboratory a comprehensive program of cotton research; and this, we say, is what cotton's program ought to be. However, some of the work outlined is already under way, in order to avoid an unjustified duplication of effort we also have made a survey of the research laboratories active on behalf of textiles, and developed so far as possible our knowledge of what research is currently under way and to what extent.

With this information at hand it is possible to make a reasonable estimate of the relative importance of the many different possible fields of research. We are satisfied, for example, that work to improve the crease resistance of cotton fabrics would have a more important effect on cotton consumption than almost any other single quality improvement. Closely following crease resistance in importance are improvements in the qualities of drape and luster.

So much for the background of planning of this research program. I think that this story may give to some of you the answer to a question which may have puzzled you somewhat; that is, why the National Cotton Council has a research division but no research laboratories, and I think it will make clear to you, in some measure at least, the task which we have set for ourselves to do.

Of more interest to you, perhaps, will be a statement as to just how the research program has progressed. In Table II, I have attempted to show some measure of the increase in cotton research which has resulted during 1948 and 1949 because of the Research and Marketing Act. Prior to last year it was estimated that the annual expenditure for cotton research by all agencies—federal, state, public, and private—amounted to between 4 and 5 million dollars. This table shows the *additional* amounts of money going into cotton research from the Research and Marketing Act.

The various state experiment stations are allotted federal funds according to a formula set forth in the bill. Of the 2½ million dollars appropriated for this purpose in 1948, approximately $787,000 went to sixteen cotton producing states. Of this total, about a third, or roughly $250,000, was expended for research on cotton production. The so-called "regional" money is for cooperative research between the Department of Agriculture and several states on problems of a regional nature and is almost exclusively devoted to production research. Marketing research funds are aimed at improving the marketing system and the preparation of cotton and cotton products for market. Utilization research, of course, is for improvement of cotton products and processing methods, and for development of new products. The Research and Marketing Act expenditure of more than a million dollars represents a gain of about 20% in total cotton research effort. This does not begin to be adequate, but it helps.

TABLE II

	1948	1949
State Experiment Stations	$250,000	$325,000
Regional Production Research	155,000	190,000
Marketing Research	140,000	315,000
Utilization Research	495,000	540,000
Total RMA Cotton Fiber Research	$1,040,000	$1,370,000

In the production and marketing of cotton, the problems given highest priority* are:

1. Mechanization of cotton production.
2. Improved ginning of cotton.
3. Improved cleaning of cotton prior to shipment to mills.
4. Improved control of insect damage, which annually takes about one-seventh of the total cotton crop.

Already, important strides have been made in achieving mechanization of cotton production. Mechanization has brought some and will bring more important economies to cotton farming. In contrast to our primary industrial competitors, which seem to have reached the point of diminishing returns relative to more efficient and economic production, cotton has great potentialities.

It has been calculated that 50% or more of the cost of producing cotton is hand labor. Cotton requires 5 times as much labor as wheat, and 3½ times as much as corn to produce an equal income. The average cotton farm worker in the United States operates only half as much equipment and produces 3/5 as much as the average farmer in the United States.

Last year only about 3 to 5 per cent of the cotton taken from the fields was produced by fully mechanized methods. This leaves 95 to 97 per cent produced under various degrees of mechanization. We look to a day when maximum mechanization will be obtained. Tremendous savings are bound to result, for all of the steps in production of cotton formerly accomplished by hand labor and mule equipment can now be done mechanically. Thus, for example, tractor power has greatly speeded plowing, harrowing, and other steps involved in seed bed preparation. Automatic planting machines are available. Mechanical or flame choppers have been developed to replace the old hand operation of chopping out or thinning the cotton plants. Weeds which formerly were cut out by a man with a hoe are now burned out with a flame cultivator. This device utilizes a jet of flame which kills the weeds but does not injure the heavier cotton stalk. Cotton is harvested mechanically, either by use of pickers or by strippers. Airplanes are used to spray the cotton for control of insects and for defoliation of the cotton plants before picking.

There are many problems in mechanization. Some of the machinery is bulky, cumbersome and expensive; it is not too well suited to use on small farms. Mechanically harvested cotton is lower in grade than hand-picked cotton. These

* The order of listing does not necessarily represent relative priorities.

problems can and will be solved. While mechanically harvested cotton is lower in grade because of leaf and twig content, the cotton fiber itself is generally stronger and better because the cotton is not exposed to weather for long periods while awaiting the hand picker.

Let us look at the figures which show just how great the saving is under mechanical production. In the Coastal Plains of North Carolina, 118 hours of labor are required on the average, using the old standard one-half-row mule equipment. With modern 2-row equipment, mechanical chopper, flame cultivators, and mechanical picker, labor requirement per acre is reduced to 20 hours, a saving of 98 hours per acre. In the Mississippi Delta, 141 hours of labor are required with one-half-row mule equipment. With modern 4-row equipment, flame cultivator, and mechanical equipment, 28 hours are required, a saving of 113 hours per acre.

This information should make it amply clear that cotton has great opportunities in the field of lower production costs. Now what about our competitors? After reduction to a price of 25 cents per pound in September 1937, viscose staple dropped to 24 cents in May of 1943; then rose again to 25 cents in April 1944; to 28 cents in November 1946, to 32 cents in January 1947. It is now selling for about 37 cents. Indeed I was surprised and delighted the other day to hear a remark by a prominent textile man which heretofore I had heard applied only to cotton. His remark was, "Rayon has priced itself out of the market."

After a careful study of all the recognized factors influencing the price of rayon, Robert Evans of the Southern Regional Research Laboratory in a report to a Congressional committee in July 1947 said, "A decline in rayon prices to approximate wartime levels (about 25 cents) is not improbable as the postwar readjustment period in the nation's economy ends, but it is unlikely that reductions of more than a few cents per pound below those levels can be made in the foreseeable future."

Perhaps of more immediate interest to this group is the subject of research in the field of cotton utilization. Since Dr. Ward of the Southern Regional Research Laboratory will discuss some of this work, I will try to give a brief sketch of some of the more interesting projects which are not to be discussed by him.

The research work on cotton fiber under the Research and Marketing Act at the Southern Regional Research Laboratory is grouped under two rather general headings: (1) Fundamental Characteristics of Cotton Fiber, and (2) New and Improved Cotton Products. Titles of the research projects to be studied under the first of these two classifications are listed in Table III.

TABLE III

FUNDAMENTAL CHARACTERISTICS OF COTTON FIBER

1. Microscopical evaluation of the swelling of fibers as a basis for selecting cottons for new types of protective fabrics.
2. Study of changes in the cellulose of cotton fiber upon oxidation and discovery of new methods for eliminating or substantially reducing the deleterious effects produced by such oxidation.
3. Chemical bonding of cotton fiber with resins for the purpose of producing new cotton products.
4. Improvement of elastic recovery of cotton fiber by chemical modification.
5. Energy relations in performance of mechanical cotton goods.
6. Estimation of immaturity in cotton by means of dyeing.

The first two of these projects will be discussed in some detail by Dr. Ward, so I will only mention them by title. The third project represents a somewhat different approach to an old problem. All of you are familiar with the application of resins and other materials to cotton fabrics to achieve various effects. Application of starch, for example, imparts crispness to cotton fabrics. There are glazed finishes, water repellent finishes, and so on. Some of these are more durable than others, but none are permanent. This particular line of work has for its aim the actual linking of resin type materials to the cellulose molecules of the cotton by means of stable chemical bonds, as, for example, ether linkages. Such linkages, if they can be achieved, would result in making the resin coatings more truly permanent.

There is under way, also, work to improve the elastic recovery of cotton fiber by means of chemical modification of the cellulose in the fiber. As most of you know, the cellulose molecules as they occur in cotton appear in the form of very long, closely packed, and rather rigid chains. This structure makes for a very strong fiber, but it also makes for a rather inelastic structure. It is hoped that by swelling the fibers, which would result in some spacing out of the chains, and then reacting the cellulose molecules with chemical compounds having rather bulky groups, it will be possible to retain some of this spacing and thereby contribute to the elasticity of the molecules. This is a study of the most fundamental kind. Practical application of the results would, of course, lie somewhere in the future, but the implications of the successful completion of the study are very great indeed.

A fifth project in this group concerns a study of the energy relations involved in the performance of mechanical cotton goods. In the textile industry there are many, many testing devices which are used in an attempt to evaluate in the laboratory the performance of a textile in actual service use. No single one of these tests is completely satisfactory. There is usually a great disparity between the results from laboratory testing and those from service testing. The concept behind this work is that it may be possible to relate the amount of energy absorbed by the cotton yarn or fabric undergoing test to the actual performance of the material in service. It is a new and fresh approach to an old problem and one which we believe gives hope of a practical solution.

The sixth project relates to quantitative measurement of immaturity This is an extension of the work already done by the Southern Regional Research Laboratory on differentiation of thin and thick walled fibers.

The second major division of work at the Southern Laboratory is closer to what is often called applied research and involves studies relating to better mill processing and improved cotton products. (Table IV.)

The first project is a study of the effect of twist on the efficiency of weaving and on the quality of woven fabrics. While much is known about the relationship between twist and yarn strength, apparently little work has been done which would relate the amount of twist to the number of ends down which occur in the running of cotton. The results of this project would be of a very considerable value to the cotton mills.

The second project involves the development of cotton fabrics and garments of improved warmth quality. Because cotton generally is not as resilient as certain other fibers, cotton garments are not likely to be as warm for a given weight of fabric as are garments made from more resilient fibers. Needless to say, the development of cotton garments which would have good warmth qualities but still retain cotton's launderability and other desirable properties would greatly increase cotton consumption.

One outlet for textiles that seems to be growing rapidly is the plastic laminate industry. In laminates cotton has many natural advantages over all of its competitors. It is strong, it bonds well with the resins used in the laminating trade, and it is usually readily available. Except

TABLE IV

DEVELOPMENT OF NEW AND IMPROVED PRODUCTS

1. The effect of twist on the efficiency of weaving and on the quality of woven fabrics.
2. Development of cotton fabrics and garments of improved warmth qualities.
3. The development of improved plastic laminates with cotton as a filler.
4. Improvement of the resistance of cotton bagging fabrics to penetration by insects and rodents.
5. Development of swelling type water-resistant fabrics.

TABLE V

CONTRACTED PROJECTS

1. Adaptation of cotton yarn for tricot knitting machines.
2. Improvement in resistance of cotton textiles to soiling.
3. Application of infra-red techniques to the study of deterioration of cotton cellulose.
4. Improved control of neps in the manufacture of cotton textiles.
5. Improvement of cotton warp yarns for carpets.
6. Development of an improved instrument to determine the tensile strength of cotton fibers.

for certain very special applications, cotton is an excellent filler for use in plastic laminates. Nevertheless, competitive fibers are continually working to get into this market, and they are succeeding to some extent through close cooperation with the laminating trade. In an effort to offset these activities of our competitors the Southern Regional Laboratory has initiated work aimed at improving and reducing the cost of manufacturing plastic laminates.

Cotton's second largest market lies in the bag industry. Here again cotton is faced with vigorous competition from industrial products. With all of its many advantages cotton still has need for certain improvements, one of the most urgently needed being improvement in resistance of cotton bagging fabrics to penetration by insects and rodents. Work is proceeding on this problem.

And finally, tying in with the fundamental research on the swelling of fibers, there is a project to develop water resistant fabrics from fibers which swell when wet. The objective is to find the optimum construction of yarn and fabric for this application.

As previously noted, the Research and Marketing Act authorizes and indeed encourages the Secretary of Agriculture to contract with appropriate institutions for the conduct of research projects. Under this authorization six contracts have been placed with various agencies. (Table V.)

One of the more interesting of these problems concerns the improvement of cotton yarn for use with tricot knitting machines. Warp knitting, which is a special application of the knitting technique, has developed rapidly since the first World War. One of the most recently developed machines, the F.N.F. Warp Knitting Machine, knits at the extreme rate of 1000 courses per minute as an economic operation. With smooth, uniform filament yarns, it is possible to realize the full advantage of this rapid production rate. However, with cotton yarns the machine must be run at a slower rate because of the presence of slubs, soft twisted spots, or other imperfections in the yarn.

Many in the textile industry believe that the use of the tricot knitter is bound to increase. They point out that this machine produces a dress fabric 84 inches wide at the rate of 35 to 40 linear yards per hour, and that this high rate of production represents a considerable advantage to the fabric producer. If tricot-knit fabrics gain popular acceptance, and if the machine itself is adopted by the fabric producers, cotton must do everything it can to place itself in the best possible competitive position.

The second project under contract is aimed at improvement in the resistance of cotton fabrics to soiling. Our studies into cotton's competitive position make it very plain that improvement in this quality offers one of the real opportunities for cotton to expand its markets, for improved soiling characteristics are important in such end uses as carpets, drapery and upholstery fabrics, and apparel. There are three general concepts from which this property should be studied. A basic study should be made of the effect of static charges on the retention of soil. Some preliminary work in this field has been done, but more is needed. Studies should be made of the effect of dye index and opacity on the extent to which small quantities of soil are apparent.

Perhaps the most promising field of study, however, is that concerned with the surface characteristics of the fiber. The very properties which make cotton so valuable from the standpoint of spinning quality and yarn strength increase its tendency to pick up soil. Silk and the synthetic fibers have a relatively round cross-section, but the collapsed, spirally convoluted form of the cotton fiber produces many little crevices in the yarn which aid the mechanical retention of soil. These have been referred to as the unswept corners of cotton yarns. This effect can be diminished, of course, by mercerization or other treatments to swell the fiber. Such treatments, however, increase luster which itself makes soiling obvious, and probably any such changes would have to be accompanied by delustering treatments. Other methods of making smoother yarns, of course, would involve application of various finishes such as resins.

We have noted before the need to find out more about the deterioration of cotton cellulose. Everyone recognizes that this is an extremely difficult research problem and that the main difficulty has always been the lack of suitable tools for determining just what changes have taken place in the cellulose molecules. One tool which gives considerable promise is the infra-red absorption technique. It is commonly recognized, of course, that certain chemical groupings within molecules will give characteristic absorption patterns in the infra-red light spectrum. In cellulose, however, it has been impossible to get true absorption patterns because of the difficulty in obtaining a true solution without bringing about further changes in the cellulose. The objective of this project is to develop a satisfactory technique for obtaining true absorption patterns. Two techniques which have been suggested are suspension of the fibers in a medium of equivalent refractive index and the use of finely ground fibers. In any event, successful solution of this very fundamental problem would be of great assistance in furthering fundamental research on cellulosic structure.

The presence of neps in a yarn or fabric is of considerable importance to a manufacturer since it is one of the primary influences affecting the value of the product. Something is known about the cause of neps. For example, we know that neps frequently result from presence of immature fibers in a given mill mix. We know that as the carding rate is increased the incidence of neps also increases. However, there seems to have been no very complete study made for the purpose of determining how and where neps are formed or of determining how best to eliminate them. Accordingly, we believe that the results of this research work will be of considerable aid to the textile mills.

In the carpet industry cotton is faced with increasing competition from rayon, particularly in the manufacture of warp yarns used in the back. Cotton, of course, has the bulk of this market at the present time, around 30 to 40 million pounds of cotton being consumed each year. Perhaps the two lines of work which would result in greatest benefit to the carpet manufacturer would be improvement of warp yarns in bulk/strength ratio and improvement in dimensional stability. Both of these problems are under investigation.

And finally, a contract has been let for the development of an improved instrument for measuring the tensile strength of cotton fibers. This is not to imply that the present strength testers are not useful devices. However, there are ways in which they can be improved. One desirable improvement would be the development of a machine which would give results in terms of absolute values instead of a strength index. Of course, anything which can be done to increase the uniformity of results or to improve the speed of the results, or in general to make the machine more useful, would be advantageous.

So much for the projects which have already been activated. Now let us take a brief look at a few of those which are planned for early consideration. (Table VI.)

TABLE VI

1. Improvement in the Crease Resistance of Cotton Fabrics.
2. Improvement in the Draping Qualities of Cotton Fabrics.
3. Improvement in Luster of Cotton.
4. Development of a Satisfactory Method for Determining the Frictional Properties of Cotton Fibers.

We have said that one of the most important problems of all concerns the development of improved crease resistance in cotton fabrics, and a study along this line is planned.

Another project concerns the draping characteristics of cotton fabrics. We know, for example, that simply by addition of water we can soften the cotton fiber and make it about ten times as pliable. We feel, therefore, that it should not be too difficult to find some useful compound which would improve cotton's drape.

Our analyses of cotton's markets have convinced us that improved luster will do much to increase cotton consumption. There are several ways of improving the luster of cotton, but better and cheaper ways are needed.

Methods for measuring the coefficient of fiber friction are known; yet none of them have been too useful with respect to cotton fibers. If we can develop a satisfactory device for measuring this quality we believe that we might find a relationship between fiber friction and the spinning quality and the strength of yarn made for particular cottons. Therefore, consideration is being given to a project for developing a device for measuring fiber friction.

The objective in discussing this program with you is to arouse your active interest in it. We hope that you will keep yourselves informed regarding the progress of those projects which are of particular interest to you.

We do not expect over-night results from this program. We do feel, however, that the program so far under way and its potential future expansion are encouraging factors concerning cotton's future competitive position.

Discussion

QUESTION: How do you go about improving the drape of cotton fabrics?

ANSWER: The desirable drape of any fabric depends upon the use to which it is to be put. Cotton has its own characteristic drape, which is desirable in some uses. Sometimes, though, you want a softer fabric with a hand similar to that of wool or silk. If you want to broaden the markets for cotton, one way to do it is to find a method of giving it a drape more nearly like that of wool or silk so as to make it more suitable for use in suitings, for example. At the present time probably the best method to improve the drape of cotton is to vary the fabric construction. However, I am not a textile engineer so that I cannot go into detail as to the variations which give the best results. Another possibility is to improve drape through finishing techniques. We know, for example, that simple addition of water to cotton increases its flexibility about ten times. Hence, we think it should be possible to find some other material which would achieve the results which we desire.

QUESTION: That is not quite what I meant. What I meant was, is the information available to you on the best methods of finishing or is it necessary to start right from the beginning? For instance, if you want to determine what methods for giving cotton crease resistance are already being developed, is the information available to you from the various organizations who are doing the work, so that when you start your research you are able to take advantage of this prior information?

ANSWER: No, the information developed by private concerns is not generally available to us. We can get some information, but we cannot get all of it. Frequently we know that some work is going on, but we are not able to find out very much about it. Naturally, the people who are developing these things are not going to tell us about them. This is a situation we just have to accept.

QUESTION: In other words, there is a danger of duplication.

ANSWER: Yes, there is a danger of duplication. However, that is a risk we have to run. If we do not know what is going on, or do not know how effective the process under development is, we feel that it is necessary to go ahead with research work along the lines which seem most logical.

DR. H. A. THOMAS: Dr. Smith was speaking about the mechanical pickers and the great advantage in allowing more rapid harvesting to be made with improvements in quality of the cotton and cost of harvesting. I was wondering if the mechanical pickers apply to the very small farms that are in existence, or whether a much smaller machine will have to be developed for that purpose. In closing this question, I would like to make one general remark because I am from the rayon industry in England and I appreciate Dr. Smith's point very much. I think that he has made a very broad summary of the work that needs to be done in improving cotton for its many uses, and in improving the quality and methods of harvesting of cotton. Naturally, he looked at it mainly from the American point of view. We have a different viewpoint in England. We have got to look at the export market, whereas you have most of your customers on the doorstep, but the whole of the American continent makes a very big doorstep. I can quite appreciate his point of view that the rayon fiber at this stage must be looked upon as a competitor of cotton. However, I should like to put the broad viewpoint before this meeting that was expressed in the joint meeting of the American Association for the Advancement of Science, and the British Association meeting which was held in Britain this year. Both groups made the point that in approximately seventy years' time the population will be double what it is today, and instead of two acres per person for growing food and cotton and timber for making rayon from wood pulp, there will only be one acre of the world's surface per person. I think, Mr. Chairman, that we are all going to have to bend our energies to meeting that condition and that there will not be sufficient cotton grown to meet the demand. There will not be sufficient rayon grown to meet those demands, and I think that we could very well pool a great deal of our knowledge on some of the mutual problems that we have. I really think that perhaps in twenty or thirty years' time, Dr. Smith, or his successor in the National Cotton Council, will then have to put his effort not so much on crease resistance or soiling resistance—we believe that those problems will be solved; I am sure they will be by then—but rather on how to increase the crop of cotton, how to combat completely the attack by insects which, as already said, results in a loss of one-seventh of the cotton crop. I think that one point very worthy of consideration by the National Cotton Council is this question: Is it going to be of more value to humanity to grow cotton on that portion of the acre of surface available per person, or timber, or is there room for both, in order that there will be sufficient fibers available? That might be quite a statistical survey which would require a very broad viewpoint and which would necessitate taking the competitor's view with respect to world requirement.

ANSWER: There can be no question but that in the long pull the requirement for fibers may be sufficiently large to use up all of the cotton we can grow and all of the rayon we can produce. However, we cotton folks are faced with an immediate problem which we must meet right now. Rayon and other synthetic fibers have moved into markets formerly held exclusively or predominantly by cotton. They have achieved this by the application of their very excellent and very effective research programs. Cotton has the problem now of meeting this com-

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REPORTS OF RESEARCH COMMITTEES PRESENTED AT GENERAL RESEARCH COMMITTEE MEETING

September 24, 1948

Snag Resistance

The last report of this committee was made on April 2, 1948. In this report, it was pointed out that the interests of this committee over-lap those of Sub-Committee A12-D13 of the ASTM. Three members of the AATCC committee are also active members of the ASTM committee, while a fourth member of the AATCC committee is from a firm which has an active member on the ASTM committee. The chairman of the AATCC is a member of the ASTM committee and vice versa.

The chairman of the AATCC committee is at present supervising an inter-laboratory program sponsored by Sub-Committee A12-D13 of ASTM which has as its purpose the evaluation of the sand-paper type tester for judging the snag resistance of ladies nylon hosiery. The results of this inter-laboratory test program are expected to be complete and a report prepared by the middle of October. Copies of this report are to be made available to the AATCC committee by agreement with the chairman of the corresponding ASTM committee.

No other work is being carried out by the AATCC committee currently and no work is planned until consideration of the results obtained in the related ASTM program are considered.

J. E. SMITH
Chairman

Water Resistance

Report of Meeting, September 23, 1948

1. A motion was made, seconded, and unanimously carried that the Rain Tester and the procedure as published in the *Year Book* as a tentative standard be presented to the General Research Committee for official acceptance as an AATCC standard testing apparatus and as an AATCC Standard Procedure with the following modifications:

a. The apparatus may be adapted for a one foot head.

b. Water penetration as indicated by the increase in weight of the blotter be not restricted to a five minute exposure during the test period and that the sentence in the last paragraph on Page 149 of the Year Book under "Evaluation" be eliminated. The sentence reads, "Penetration of over 10.0 gr. are recorded as 10/gr."

2. Another motion was made and seconded and unanimously carried that the AATCC at Lowell determine which manufacturers are able to supply blotting paper to meet AATCC requirements and that Lowell arrange to have paper manufactured, stored, and supplied to the users thereof. Orders for such paper may be sent to Lowell to be transmitted to the manufacturer for invoicing and shipping from approved stocks.

3. It is further moved and unanimously carried that the Executive Committee on Research be requested to appoint a joint committee (possibly from the research committees on fastness to washing, fastness to dry cleaning, evaluation of durable finishes and water resistance of fabrics, with not over three members from each committee), to establish a standard test procedure for washing and dry cleaning water resistance fabrics to test the durability of the finish.

4. It was recommended not to restrict the purchase of water filters in conjunction with installations of the Rain Tester to those manufactured by the Filtrene Company, but it was felt advisable to recommend their filters and other approved filters whenever inquiries were received.

At the AATCC General Research Committee meeting held Friday afternoon, September 24, it was moved, seconded, and unanimously voted that the recommendation of the Research Sub-Committee on Water Resistance of Fabrics be officially approved. This means that the Rain Tester now is an official standard test apparatus and the procedure as published with the above modifications become an official AATCC test procedure.

A. McNULTY
Acting Chairman

Durability of Finishes

Report of Meeting, September 23, 1948

Mr. Stewart showed a model of the Monsanto wrinkle recovery tester of which over 100 are in use and explained its advantages over the TBL method, stressing its greater accuracy by measuring the angle of recovery rather than by chord length, the elimination of handling the sample and the scheme for hanging it vertically so that gravity was eliminated. Furthermore it sells for $15.00.

Messrs. Stock & De Waard of American Cyanamid showed their model, a motor driven roller pressure method in which the angle is measured by its contour shadow on a lighted screen. Accuracy to $\pm$ 1° was claimed and the various factors influencing the measurements have been studied as printed in the Aug 9th '45. *Dyestuff Reporter*. So far only 3 models of this machine are in use, but it was estimated that duplicates could be made for about $150.00 and that a modification would permit running several samples together, thus saving time.

The Committee agreed that both instruments were superior to the TBL method and that both should be checked against each other. To do this at least 5 samples of cloth, both treated and untreated, will be sent with each instrument to perhaps 5 different laboratories with standard instructions for testing them and an interlab comparison made with a statistical review of the results, so that one or both may be recommended as a tentative standard. It is hoped that this work can be completed before next June as there is an urgent need for satisfactory standards of performance of crease resistant finishes in today's market and this in turn must wait on a saitsfactory method of testing.

KENNETH H. BARNARD
Secretary

Perspiration

Report of Meeting, September 23, 1948

The regular meeting of the Sub-Committee on Perspiration was held on Sep-

tember 23, 1948, at which time most of the controversial points pending on the adoption of the new Perspiration Method were discussed and settled.

There was an opportunity to examine the latest model of the Perspirometer which we expect to adopt as a part of the new testing method. This simple device uses the plate method for carrying out the tests but has the advantage of accurately measuring the proper pressure on the plates and materials under test.

The Committee is proceeding with the re-writing of the specification and hopes to submit the complete testing method for approval as a tentative method at the meeting of the Research Committee in Augusta next month.

C. H. A. SCHMITT
Secretary

Dimensional Changes

The work of the Sub-Committees on Dimensional Changes in textiles has been confined entirely to studies on wool products.

The Philadelphia section under the Chairmanship of Joseph Goodavage, is nearly ready to report on a tentative method for measuring shrinkage in wool socks.

The Boston section under the Chairmanship of Arthur Anderson, has already submitted a Tentative Method for Determining Shrinkage in Woven Woolen Fabrics. This Proposed Tentative Method for Woven Fabrics was submitted to the FTC at the recent hearing on wool which the Commission conducted in New York on September 16. At the time that this Proposed Tentative Method was submitted to the Commission, it was stated that the method was subject to change in the period between that meeting and this meeting today. Minor changes were made in this method in a meeting of the Committee on Dimensional Changes held yesterday afternoon. The minor changes are incorporated in the Tentative Method which I am submitting with this report.

The changes which were made were changing the specifications of the apparatus from that of the cylinder 27″ in diameter and 15″ deep, to the Trojan Najort No. 1 type with a cylinder 24″ in diameter and 20″ long, as specified in the current *Year Book*, or its equivalent. The reason for this change was that the cylinder described in the original tentative method submitted by the Boston section, is one that is not in great use, whereas wash-wheels of the Najort type are widely used. The water level which was originally specified as 10″ has been changed to 7″. This compensates for the drop in the diameter of the originally proposed machine from 27″ to 24″.

The portions of the present tentative Standard Method, which the Committee felt required further study, are the following:

Soap—Mr. Weiner of the Philadelphia Quartermaster Depot, has figures which show that the degree of felting shrinkage varies greatly with the soap content in the wash wheel. Especially is this true in the concentrations between 0 and 0.1%, although there is still some variation as high as 0.2% concentration. It has been the experience of the Quartermaster Depot that an accelerated shrinkage is accomplished by dispensing entirely with the use of soap. At the same time the uncontrollable variable of soap concentration is eliminated. The Boston Committee has, therefore, been asked to carry out further studies on whether or not the proposed method should eliminate the use of soap or detergent entirely, or whether or not a sufficiently high concentration of soap at a low water level should be recommended so as to eliminate a big variable which takes place at low soap concentrations. It was also suggested that the Philadelphia Committee might wish to consider the use of a washing formula which contained no soap.

It was also suggested that the wetting out of the samples prior to measuring relaxation shrinkage be studied from the standpoint of soaking rather than spraying. Specifically the recommendation has been made that the Committee determine whether or not satisfactory wetting out can take place with a 2-hour soaking in water, or if possible a shorter period of soaking.

The present Tentative Method submitted today is equivalent in shrinkage action to approximately 3 to 4 standard commercial wool launderings. The 5 CS59-44 launderings which the FTC proposed in its methods are equivalent to approximately 3 standard commercial wool launderings. It is apparent, therefore, that the present Proposed Tentative Method is a more effective one than the 5 CS59-44 launderings proposed by the FTC, inasmuch as this Tentative Method accomplishes in one operation what the Commission's method does in 5 separate operations. It was the feeling of all at yesterday's meeting that the present Tentative Method was not severe enough in that it only predicted shrinkage results at the end of 3 to 4 commercial launderings. It was recommended that the Boston Committee try to develop an accelerated method which would approximate 10 commercial launderings, especially if it could be determined that 10 commercial launderings produce approximately the maximum amount of shrinkage to be experienced in the normal life of washable woolen fabrics.

It also was recommended that the Committee carry out investigations on washings at higher temperatures, as high as 140°, in order to determine whether or not these higher temperatures are a suitable means of accelerating the test method, if there is need for such acceleration. It was felt that 100° is desirable temperature, if the speed of the wheel could be increased in such a manner as to duplicate 10 or more commercial launderings, but if necessary the temperature should also be raised in order to duplicate in an accelerated method the shrinkage which would occur in 10 or more commercial launderings.

W. E. COUGHLIN
Chairman

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PACIFIC MILLS ACCELERATED METHOD OF TEST FOR SHRINKAGE OF WOOL TEXTILES

APPARATUS

Washing machine of the Trojan Najort #1 Type with cylinder 24″ in diameter and 20″ long, as specified in the current year Book, or its equivalent.

Flat bed or steam press.

Hydro-extractor.

MATERIALS

Laundry soap (Fed. Spec. P.-S-566 or ASTM: D496) (Sodium oleate) stock solution may be used containing 1 pound chip soap in one gallon of water.

TEST SPECIMENS

The sample of cloth taken for test shall be at least 20″ square. The sample shall be laid without tension on a flat surface, care being taken that the cloth is smooth and free from wrinkles or creases. Three distances, each of 18″, shall be marked off on the sample in both the warp and filling directions. The distances shall be parallel to the warp or filling threads, at least 6″ apart, and at least 1″ from all edges of the sample.

PROCEDURE FOR DETERMINATION OF RELAXATION OR SPONGING SHRINKAGE

The test specimens, after marking, are placed in the sink and thoroughly wet out by spraying with an ordinary garden hose and nozzle. The hose nozzle is adjusted to a spray position. The samples shall then be hydro-extracted and flat-bed or steam pressed. The samples shall be allowed to cool at least 10 minutes in room atmosphere before measurement. The pressed sample shall be laid out without tension on a flat surface, care being taken that the cloth is smooth and free from wrinkles or creases, and the distances which were marked off shall be

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REPORTS OF RESEARCH COMMITTEES PRESENTED AT GENERAL RESEARCH COMMITTEE MEETING

Augusta National Convention, October 22, 1948

Wool Detergency

The initial objective of this committee from its inception has been the development of a laboratory machine for evaluating detergents for cleaning wool.

Mr. Ryberg's work at Lowell included cooperation with the committee, from which work was evolved the first crude model consisting of an enclosed tub and a small motor driven laundry wringer. With this model Mr. Ryberg demonstrated that by washing samples of soiled knitted wool tubing, promising results were obtained which indicated that a design simulating a dolly type cloth washer would be a satisfactory basis for a machine.

The interest and cooperation of the Riggs & Lombard Company, builders of wool finishing machinery, were enlisted by the Committee. This cooperative effort produced the second model of a Laboratory Detergency Comparator which was completed just in time to exhibit at the annual meeting in New York in 1945.

This second model was given further tests which demonstrated several weaknesses in design. Changes were made from time to time resulting in improvements in performance, so that, although the Comparator was not entirely satisfactory, the Committee felt that progress was being made and in the proper direction.

In 1946 the Prize Paper Contest Committee of the Northern New England Section included many of the members of the Wool Detergency Committee. A paper on "Wool Detergents" was decided upon for which the new Comparator was considered the best means of conducting the preparatory work. The use of the Comparator in this way showed where still more changes in design were necessary. The preparatory work for the paper was conducted under the direct supervision of Mr. Roland Derby in the laboratories of the Derby Chemical Co. in Lawrence, Mass. where it was convenient for the Committee and Dr. Stiegler to assemble and keep closely in touch with the performance of the machine.

The comparator was subsequently moved to the Arlington Mills laboratory where many more hours were devoted to giving the machine a good work out. A few samples of its performance are to be seen in the exhibit displayed at this meeting.

A new procedure utilizing a knitted worsted tube of soiled yarn within which is sewn a one-inch stainless steel ball was developed during this period. A fixed round pot eye replaced the original variable diamond-shaped pot eye and during the running of the sample the ball rides up against the pot eye causing the creases and folds of the tube to change position with each nip through the squeeze rolls. This extra work required heavier loading of the rolls and a stronger drive, but the method soon demonstrated its superiority over any previous methods tried.

Last spring a start was made toward the design and construction of a third model by the Riggs & Lombard Company in cooperation with the Committee and in July the final plans were approved. The customary delays in procuring materials and parts, with which we all have become so familiar during recent years, as well as the amount of hand work required in the building of the machine prevented the completion of the third model until last week. In fact, the new Comparator was shipped directly from the Riggs & Lombard plant in Lowell to this meeting, in order that it might be viewed by the members, although the wiring up of the electrical fixtures has not been completed.

The Committee also regrets that obviously, no report can be made today on the performance of this third model.

The same basic design has been retained. The important changes are:

1. Heavier V-Belt drive.
2. Three-inch squeeze rolls with molded Hycar covers replacing 2-inch rolls and cots.
3. New bearings and load suspension for better alignment and more direct and definite loading.
4. A pair of positive nip take-off rolls to give more positive return of sample to tub.
5. New pot eye rack with set of 3 sizes of pot eyes.
6. New rinse water metering orifices in pairs of precision drilled stainless steel.
7. New type thermostat and heaters for better control of temperature.

The Committee feels that this new model of Detergency Comparator will prove to be a valuable laboratory device for evaluating the effectiveness of detergents on wool, and hopes it may have other uses where the mechanical action it provides is required.

Unless experience with the unit shows that other changes are unavoidable this model will become available. When that time arrives a marketing arrangement will be made mutually agreeable to the AATCC and the Riggs & Lombard Company.

CLARENCE L. NUTTING
Chairman

Flammability

Last year in Chicago, I reported about considerable objection to the proposed commercial standard on fabrics' flammability. This, I mentioned, had moved the standing committee of the commercial standard to appoint a technical advisory committee of seventeen members including seven of our nine AATCC committee members. This committee decided to conduct a series of tests in seven laboratories on our inclined tester on thirty-three cotton fabrics supplied by the National Cotton Council. The summary of results was not altogether satisfactory giving particularly poor correlation on long pile tufted fabrics like chenilles. It was then decided to correct the seven instruments which were returned for a check up to their maker the U. S. Testing Company, and we also worked out a somewhat better drying procedure concerning particularly the long pile fabrics. After that we started a second inter-laboratory study program, this time on twenty fabrics most of them napped cottons and chenilles. This series was tested, not only on our AATCC inclined machine but also on the horizontal tester of the National Bureau of Stand-

ards of which six specimens were specially built for these tesst. Tests were also made on a few fabrics in two laboratories on a circular vertical machine developed by Fire Marshal Yockers of California which he sent us for evaluation some six months ago and which he consented to let us exhibit at this Convention. You might be interested in inspecting it in the Green Room. The results of the two test series have been compiled into a 60-page report which in extract will be published in one of the early numbers of the DYESTUFF REPORTER. The general conclusions of this report are:

First: a precise determination of fabric's flammability is not possible by any of the testing methods due to inherent variations in fabrics' constructions and to uncontrollable differences in the manipulations of the testing machines.

Second: the inclined AATCC tester is definitely preferable to the horizontal tester of the National Bureau of Standards for the following principle reasons: the results of our tester are more consistent; the samples are smaller; and the operation of the test is simpler. Not sufficient evidence is shown that the Yockers machine would perform better than our AATCC tester.

Third: no testing machine will measure flammability of textiles with sufficient accuracy to make reference to such tests in any municipal, state or federal laws.

The inclined AATCC tester will, however, serve as a good guide to industry in the production of clothing fabrics with minimum hazard to the public. Therefore, after some recommended modifications, the tester would be suitable under the voluntary program as a commercial standard.

The committee has come to the conclusion that some more time will have to be devoted to the study of proposed slight changes on the instrument such as heightening of the string, elimination of wires from the specimen rack and a few other points of this nature. We also felt it important to study more thoroughly our arbitrary six second time limit and we would like to go into a study of the abnormal behavior of chenille fabrics which show the greatest lack of correlation in our test results. This work should be carried on by one man who can stick to his job. The results obtained by him would then lead to a third inter-laboratory testing program. The technician, it is felt, would work as a research associate in Lowell. He would get his directives from the steering group of our committee to whom he would make monthly reports in the same way our competent Research Associate for the wash fastness committee operates. It is the belief of our committee that a few months thorough investigation of the different problems will clarify the question and that we will then be in a position to set up a new commercial standard which should be acceptable to the industry.

H. E. HAGER
Chairman

Light

During the past year the Committee has continued its work along the lines of making available to Fadeometer users an acceptable calibrating medium for commercial accelerated fading devices. It is well known that such calibration is necessary because of differences in fading rates between existing machines and also because of unavoidable fluctuations in fading rate in the case of many individual machine installations. A blue paper known as Calibration Paper A was developed by the National Bureau of Standards and after test and approval by this Committee was found to serve as an acceptable means of calibrating commercial Fadeometers and basing exposures on the standard fading hour of the NBS instrument, which is under very close control.

The original supply of Paper A has been depleted and a new lot of dyed paper, known as Lot 1554, modified in conformance with the experience gained with Paper A has been made and found satisfactory after tests by the Committee. The Bureau is now in the process of preparing faded standards on the new paper, similar in calibrating value to the previous Paper A Standards, and it is anticipated that shipments of the new paper and faded standards will be made to those requesting them in the very near future. This supply of paper should be adequate for several years.

During the past year the Committee has also been investigating the possibility of accurately measuring fading intensity by means of a photo electric device, which would, if successful, largely eliminate the need for a calibration paper. Our President, Mr. Henry Herrmann, interested the General Electric Company in doing development work on a modification of their Totalux device for this purpose. One experimental unit was assembled and has been undergoing test at the Bureau of Standards; the second has recently been made and is probably very close to the form in which it will be finally offered if found suitable for the purpose. This unit will be thoroughly tested at the Bureau of Standards, and the first unit, after necessary modification, will undergo extensive tests by Atlas Electric. The results of both tests will be followed closely by the Committee, and it is hoped that eventually Fadeometer users will be able to obtain an entirely objective method of determining, with the necessary accuracy, the quantity of destructive radiation to which their samples have been exposed.

W. A. HOLST
Chairman

Dimensional Changes

The work of the Committee on Dimensional Changes in Textiles during the past year has been confined entirely to studies on wool products. This work has been split up between the Philadelphia and Boston sections, with the Philadelphia Section under the Chairmanship of Joseph Goodavage working on the improvement of methods for measuring shrinkage in wool socks, and the Boston section under the Chairmanship of Arthur Anderson working on accelerated and improved methods for determining shrinkage in woven woolen fabrics.

SUB-COMMITTEE ON EVALUATION OF SHRINK-CONTROLLED WOOL SOCKS

The objective of this committee is to develop an accelerated laboratory test procedure by which it would be possible to evaluate the effectiveness of any shrinkage-controlled process as applied to wool socks or wool hosiery. This sub-committee is working in close cooperation with the National Association of Hosiery Manufacturers and several joint meetings have been held with this association. In cooperation with NAHM 1200 pairs of full-length wool socks are now being distributed to different companies, who will apply their respective shrinkage-resistant treatments to the socks. After being treated and boarded to size, the treated socks will be distributed to various laboratories for evaluation purposes. Representative samples of the various treated socks will be subjected to the following:

(1) Ten consecutive Army wool launderings—including dry tumbling.
(2) Home laundering.
Bendix (automatic)
G. E. Spinner type (automatic)
(3) Wear test—20-25 individuals—hand laundering.
(4) Laboratory Accelerated test
Army Q. M.—140° F.—5 lb. load.

The Shiefer Machine will be used to evaluate felting shrinkage. The test is based on 10 consecutive Army wool formula launderings, which is the standard for comparison against which the results of the accelerated test will be compared.

Needless to say, the knitting, and especially the treatment by various methods of these socks are time-consuming operations, but socks are now being distributed and definite comparison evaluations

of test methods can be made in the very near future.

SUB-COMMITTEE ON DIMENSIONAL CHANGES IN WOVEN WOOLEN FABRICS

This committee has carried out a great amount of work in the development of an accelerated method for the evaluation of dimensional changes in laundering of woven woolen fabrics.

Since Pacific Mills had already used for some period of time, an accelerated wash test, this committee first established the relationship of this accelerated wash test with commercial laundry practice, home machine washing, wet cleaning practice and the CCCT-191A test. Seven laboratories participated in these tests. The participating laboratories were the following:

Arlington Mills
American Woolen Company
The Derby Company
American Institute of Laundering
Pacific Mills
New England Testing Laboratory
National Institute of Cleaning and Dyeing

The results of these tests indicated that the Pacific Mills' accelerated test was the equivalent of approximately 3 to 4 standard commercial wool launderings. This accelerated method with but minor changes has already been submitted to and accepted by AATCC as a tentative method. While this method is admittedly not as severe as is desirable, it is more severe than wool shrinkage testing methods proposed in the past and is more severe than 5 consecutive CS59-44 wool shrinkage tests, as originally proposed by the Federal Trade Commission as a tentative method of evaluation of shrinkage in woolen fabrics.

In order to improve this tentative method, the following suggestions have been made, which are now being studied by the Boston section:

1.—The use of water alone instead of soap and water for laundering in the test procedure.

2.—The desirability of adopting several successive short launderings and pressings instead of one long laundering followed by a pressing.

3.—The effect of drying the samples after relaxation in an oven, versus drying the samples by pressing.

4.—A determination of the effect of 10 or 20 commercial launderings, whichever would approximate a maximum of shrinkage in a given sample, and the acceleration of the test method to correspond to this maximum shrinkage experienced in commercial laundering.

5.—The incorporation of wetting agents in the relaxation soaking bath.

These studies are being rushed by the Boston section and it is certain that the objectives of the committee to perfect and accelerate the present tentative test method will be accomplished speedily.

The committee has not made a study of the measurement of dimensional changes in knitted woolen fabrics up to the present time, but such work is considered for the immediate future.

More work on dimensional changes in rayon fabrics is also contemplated for the near future, inasmuch as committee work can run concurrently with research which is being carried out by the laboratory at Lowell.

Two general Steering Committee meetings were held during the year in addition to the sub-committee meetings.

W. E. COUGHLIN
Chairman

Perspiration

Our Association has a standard test method for testing the fastness of colored textiles to perspiration which has been in existence for some years. This test method was developed by a very able committee. However, about two years ago, this committee was reactivated from a reference committee to an active committee, as there was some question regarding the suitability of the testing solutions, and also it was desired to develop a more flexible method of testing.

After working assiduously for the past two years, the present committee has developed a new proposed tentative test method which will shortly be submitted to the General Research Committee for its approval.

In considering the development of an improved method of testing, the following factors were considered:

1. Flexibility
2. Reproducibility
3. Simulation of actual consumer service
4. Expense of the method

In consideration of the above four factors, the committee has developed a pressure Plate Tester which has been appropriately named a Perspirometer. This Perspirometer accomplishes the following:

1. In regard to flexibility, one test only is now recommended instead of the four tests in the present standard method. Also the time of the test has been reduced from 18 hours to 6 hours.

2. In regard to reproducibility, a measured pressure of 10 pounds is exerted and measured on the plate section of the tester which results in a uniform saturation of the specimen and test fabric with the test solutions. A uniform transference of bleeding occurs on the test fabric which is capable of measurement with the Spectrophotometer or other means of measurement of color transference which is not accurately possible in the present standard test method.

3. In reference to simulation of actual consumer service, the measured pressure exerted on the test samples with the test fabric obtains the effect of flexing or body pressure in the consumer use of the fabric.

4. In reference to the expense of testing, although there may be some initial outlay in the purchase of a Plate Tester or Perspirometer, the labor cost of testing is much decreased, as 30 samples are tested at one time. In addition, the amount of cloth necessary for making the tests has been decreased.

In a review of the existing test solutions described in the present standard method, exhaustive tests with both consumer fabrics and test dyeings have indicated that they are adequate and in general very satisfactory.

The adoption of the flat 6-fiber test fabric has been found to be very desirable from the standpoint of uniform color transference.

And finally, soaking the colored specimens for a period of 30 minutes in the test solutions before squeezing, adequately cares for neutralizing the fabric, bringing it to a condition which would result in the extended use of a colored fabric in consumer wear.

JOHN N. DALTON
Chairman

Insect Pests

For a number of years, attempts have been made to set up suitable and acceptable tests for the evaluation of insect pest destruction of fabrics and materials. The designation "insects" in this study means black carpet beetle and webbing clothes moth larvae.

During these years of study, various test methods were suggested and investigated. However, when the data were collected from the various participating laboratories, a correlation was impossible. Loss of weight of fabric, excrement weight, visual examination and variations of these three were attempted. In a number of instances where an excess of allowable excrement was present, a weighable amount of clipping was also present and a definite degree of visual damage showed. The weight of the fabric after test is greater than its original weight. This is a factor which could not be explained.

It was decided in March, 1947 by members of the four interested organizations in Test Methods for Insect Pest Destruc-

tion, i.e., (AATCC, ASTM, NAIDM and NRDGA) to investigate this problem thoroughly, to disregard all previous data and findings and start from scratch. Members of these four organizations met in New York to discuss the problem and to consider all the angles that should be investigated.

It may be well to explain why the four organizations aforementioned were chosen to investigate this problem. Some members of each of these organizations' committees working on insect pest test procedures were also members of committees of another of the organizations studying the same problem. Rather than having two, three or four independent studies carried out and an overlapping of work done, as well as investigating some phase that had already been carefully studied by some other group, it was decided to pool resources and have some kind of an agreement in the entire study.

After careful thought was given the subject, a second meeting of the parties who were to carry on this work was called. This was during the latter part of March, 1947. At this meeting, tentative test methods were set up, subject to change after the first two fabrics of the series were completed. This procedure was as follows:

Seven fabrics will be used in this test, each numbered as shown below. The numbers designate the order in which they are to be run.

	Type
1. Standard test fabric	
2. High pile	Polo
3. Medium pile	Velour
4. Low pile	Broadcloth
5. Soft woolen	Tweed
6. Hard worsted	Men's wear
7. Wool crepe	Women's wear

One yard of each of the above fabrics will be sent to Geigy & Co., General Dyestuff Corporation and Merck & Co., Inc. for treatment with their respective moth-deterrent compounds.

After they have been treated, each piece will be cut into three parts. One piece of each will be sent to each of the other laboratories for testing and one piece retained. Another quarter (¼) yard of each fabric properly numbered will be sent to each laboratory to be used for untreated control check purposes.

All tests are to be run under controlled temperature and humidity conditions—80° F. and 60% R.H.

The black carpet beetle larvae (5 months old) and the webbing clothes moth larvae (24 to 27 days old) will be used as test insects. Ten larvae of each of the specie are placed on each sample.

Each individual test will be run in series of eight samples, an additional four samples to be used for humidity check purposes. Circular samples of two (2) square inch surface area will be used. Two ounce ointment tins of the label stick type will be used as test containers.

Two series of tests will be run on each fabric:

1. To be run for 14 days.
2. To be run for 28 days.

Test on each fabric will be run with the treated and untreated fabrics in separate containers, and also with treated and untreated fabrics in the same container with a distance of ½ inch between samples.

In the test where the treated and untreated samples are in the same container, the circular pieces will be cut in half, using ½ circle of each.

Starvation tests on the black carpet beetle larvae will be run concurrently with each test as it is set up. This starvation test is to be run in quadruplicate. Place ten black carpet beetle larvae in a #3 Gooch crucible and suspend in a weighing tube. Remove all cast skins and dead larvae once a week.

Fabrics #2, 3 and 4 will be run both face up and face down. Four samples of each series of eight will be placed in the test containers in this way.

When the tests are completed, the samples will be thoroughly cleaned and replaced in the container for 24 hours before weighing.

Each time a test is started, a similar test using untreated standard wool flannel fabric will be put on.

Factors to be considered in the final evaluation:

1. Loss of weight in milligrams
2. Excrement weight in milligrams
3. Clipping in milligrams
4. Visual damage (holes or clipping)
5. The difference in feeding will be figured, based on the untreated fabric of the same material and also against the untreated standard fabric, at the completion of each step in the test.

The data obtained in each of the laboratories will be sent to the other two for study. After this study has been completed, the interested parties will meet to evalute the results.

After the tests on the first two fabrics had been completed, another meeting was called, at which time it was decided not to change the test procedure. One of the participating laboratories, however, showed the same discrepancy that had been noted in previous studies, i.e., an increase in weight of the test sample which showed visual damage, and also weighable clipping. This particular laboratory was not equipped with a temperature and humidity controlled room, but did their testing in a temperature and humidity controlled chest, desiccating over a saturated solution of sodium chloride before starting the test and also after the test had been completed. It was decided to check-weigh the tests by sending them to a laboratory equipped with a temperature and humidity controlled room before setting the test up, allowing the samples to condition for several days, weighing, returning them to the original laboratory for test. At the completion of the test, they were desiccated over sodium chloride, weighed, returned to the laboratory equipped with controlled conditioning room and re-weighing after several days of conditioning. This same increase in weight showed in several samples handled in this way. The procedure followed was carefully checked, step by step. One of the samples showing an increase in weight was carefully washed off in distilled water and tested for chloride with silver nitrate. A decided positive reaction for chloride was noted. It is well known that saturated solutions of salts crawl. Due to this crawling, some of the salt was deposited on the samples causing an increase in weight. Desiccating over a salt solution was therefore discontinued. The following procedure was then used by this laboratory. The samples were sent to the laboratory with the controlled condition room. The material conditioned several days and weighed, returned to the original laboratory for testing. At the completion of the test, the samples were weighed, sent back for conditioning and weighed again. This discrepancy in weight increases was eliminated and it was also found that it is unnecessary to condition the samples before or after the test provided the whole series of samples used for test purposes and humidity control checks are weighed at the same time. It is, however, necessary to run that part of the test while the insects are on the fabric under controlled conditions.

After the entire series of seven fabrics had been completed by the three laboratories, the data were summarized and graphed. The summaries and graphs were based on loss of weight of fabric and excrement weight. Realizing at the beginning of this test that it was impossible in most instances to get the same fabric in question both in the treated and untreated state, the figures obtained from the untreated standard test fabric run concurrently with the other fabrics of the series were used. Also the figures obtained on the original standard flannel test were also used in the summary and graphs.

The summary and graphs were based not only on the loss of weight of fabric and milligram excrement, but also on the

per cent retained protection. This per cent retained protection is figured using the untreated fabric figures as the maximum amount of feeding possible and calling it 100% destruction or no protection, and in the case of excrement weight, the maximum amount of excrement possible. The weight loss and/or milligram excrement figured in this way will give the per cent retained protection in numerical form.

It was found that the activity of the larvae in the different laboratories varied, but a high feeding factor on the untreated fabric also showed a higher feeding on the treated material.

This study was completed only a few weeks ago and to date there has not been sufficient time to study the results carefully before calling another meeting of the various participants and drawing up any definite conclusions. This, however, will be done before the next research committee meeting at which time a complete report and recommendations will be submitted.

H. E. WILDE
Chairman

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Contributions to Industry—

(Concluded from Page P861)

If you agree with me that we are an essential facet of the American textile and dyestuff industries, then we are entitled to the corporate support of the companies comprising them. The AATCC has no benevolent benefits for its members, it has no political aspirations, its salaried staff is barely able to cope with an ever-growing burden of urgent assignments. It does not seek profits or waste its sustenance in the cultivation of seeds of glory for its own aggrandizement. It stands before its industrial sponsors humbly to offer its services to them—conscientiously and economically. The fruits of our work are our sole reward but they are keystones in the industrial structure of our industries.

"Just among ouselves." This is my last theme and I will not ask for a closing of windows to prevent the absent audience from hearing these personal remarks. You have made me your president and rely on me for foresight and leadership. I thank you for the trust you have imposed in me. I will not speak of arduous labors because the joy of doing things in which one has faith makes pleasure out of work—just as a hobby converts one man's job into another's pastime.

I want you—all of you—to join me in an endeavor to push our association to the pinnacle of recognition here and abroad in the regulation of the standards which control the wet processing of textiles. We have no aspirations in the field of textile design, spinning or weaving nor in the aura of fundamental research. Our interests are in preparing goods, dyeing or printing them, and finishing them for the market. We want to help our plants to do a good job and having done so to define the quality of the work in terms which the distributing trades and the consuming public will understand. We are writing a new language for this purpose —composed of standards and quality definitions—to replace the Babel of confusion which still besets us and defies the governmental and consumer interests which aim at regulations which should spring from within the industry and not from without.

When I say *we* should do these things I mean just that. We—you and I—not people we hire. Anybody can hire chemists. Most likely the employer will dictate the policies and interpret the results. Probably the interest with the most resources or political power will win. I cannot stress too strongly the responsibility we have accepted in the formation of this association. If we are to be the workshop and the voice of the industry we cannot farm out our responsibility to work—we cannot hire others for pay without relinquishing to them the privilege of seing the evidence firsthand, weighing it and drawing final conclusions. We are approaching a membership of 6,000. Although the workers in committees constitute a formidable number I feel that the percentage should be larger. Our strength lies in the men we have in the field. A full grandstand is nice and the "gate" helps—but the AATCC as I see it belongs on the scrimmage line.

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Cooperative Research—

(Concluded from Page P862)

ness tests or instigate some movement allied to the textile industry which would be totally unsatisfactory to you as textile processors if it were not for the help and assistance which they request from time to time through the General Research Committee of the AATCC.

It is hoped that the few highlights just mentioned will act as positive proof to you that you really have a much better industry than otherwise would be if you were not contributing as corporate members.

Please do not hesitate at any time, through the officers of the association, or through members within your own organization, to ask any questions covering the work of the association, or specifically to what use the corporate membership dues are being put.

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President's Address—

(Continued from Page P863)

may carry with it not only personal gratification but also material benefits. You will all agree that the advances being made in textile technology are so rapid that any one not in close touch with events will grow stale very quickly. Extension college courses are good but the privilege of the few who can avail themselves of such a luxury. However, they are not the answer to a certain degree of obsolescence in knowledge of important advances in practice which will be adopted by industry before they are incorporated in formal school curricula.

That the AATCC is a means of communicating knowledge to its members is so obvious that it is seldom mentioned and my contention is that it is too important not to stress to you. Rugged individualism is often cited as a virtue but if it is not coupled with genius, it may lead to barren results. Association work is a pleasant road toward the goal of keeping abreast of the times in scientific matters, through the help and companionship of agreeable wayfarers.

The second phase of our objectives refers to research work on chemical processes and materials. Excellent examples of this are the recently completed projects on:

O.D. #7 for the Quartermaster.

A confidential investigation for C.W.S.

The common salt study.

The improvement of O.D. dyeing on wool for the Quartermaster which was completed during the war and directly affected subsequent procurements by the Army.

A new study of stainless steel in relation to its life expectancy in dye house equipment.

These investigations speak for themselves. For some we have received special

financial aid, but the rest were financed out of our regular budget. What else we do in this direction can only be determined by the research funds which our corporate members place at our disposal. Our policy is to confine all our work to problems which have a wide industry appeal. Special investigations which have a narrower interest must be self-supporting through direct compensation by the sponsors.

By far, the largest enterprise in which our association embarked early in its history is not mentioned in the constitution. I refer to the working out of quality standards, testing methods and special testing equipment. The exhibit in the Ball Room is only a partial display of this. I point with pride to the present status of standards and methods as listed in the new *Technical Manual and Year Book*. In my opinion, this sort of work must be pursued to its logical conclusion which means it has no visible end. As textile technology advances, standards will have to keep an even pace. They may remain static for a few years, but as surely as we are gathered here tonight, there isn't one standard now considered satisfactory which will not require over-hauling so as to embrace the inevitable progress in all resistances to color and finish destroying agencies. This means that we cannot disband our Control Committees: they may be deactivated temporarily, but must remain alert to changed conditions requiring new studies.

Before closing this message, I wish to thank Booney Newman personally and in behalf of the parent body and through him the tri-section Southern Committees for their wonderful hospitality, the warmth of their greeting and for laying the groundwork of this outstandingly successful Convention. It evolves on me to thank the National Committee men who also contributed to this success—Miles Dahlen for a fine Technical Program, Ken Barnard for helping our Southern Committees in the basic planning, Paul Luck and George Schuler for technical publicity and press abstracts, and last but not least, Pat Kennedy for engineering as fine an Intersectional Contest as we have ever had. I assure you it has been a treat for the national officers to work with you.

And so goodbye—'til October 1949 in Atlantic City. God be with you 'til then.

Inquiries regarding the EMPLOYMENT REGISTER should be directed to the National Secretary

Cotton Research Program—

(Concluded from Page P870)

petition through application of the same techniques. We feel that it is absolutely necessary for us to bend every effort to improvement of cotton for specific end uses and for achieving a more efficient production.

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At a point later in the discussion, someone asked how much of the money from the Research and Marketing Act went to the Southern Regional Research Laboratory. The answer to that question was that during the fiscal year 1948 the Southern Regional Research Laboratory received approximately $141,000 for research on cotton fibers and cotton products. In addition to this, they received $72,000 for research on cottonseed. An additional sum was expended on research projects undertaken through contracts with laboratories outside of the Southern Regional Laboratory. Although these projects were generally supervised by the New Orleans laboratory, the work was actually conducted outside.

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Research Reports—

(Concluded from Page P872)

measured again. The shrinkage in the warp and filling shall be calculated separately as the average obtained from the three marked distances. The change in dimension is measured with a steel scale graduated directly in percentage and the result recorded as sponging or relaxation shrinkage. (It is essential in the spraying operation to prevent undue distortion of the sample, such as picking up the wet sample by one corner. The best method of handling the wet sample is by turning in the edges and corners of the specimen and picking it up as a ball which can be loaded directly into the basket of the centrifuge. After hydro-extraction, the sample is opened on the buck of the press without any stretching and pressed dry.

PROCEDURE FOR DETERMINATION OF FELTING SHRINKAGE

The samples to be tested and such additional cloth as necessary to make a 3 pound load shall be placed in the washwheel. The required amounts of water at 100° F. and of soap shall then be added for the sudsing operation. A 7" water level is used in our wheel for both sudsing and rinsing operations. The amount of soap used should be sufficient to produce a head of suds at least 1" high. In general, the strength of the soap solution is about 0.1% as an average. The washwheel shall be kept running continuously for 75 minutes from the start of the test. The temperature of the wash liquor shall be maintained at 100° F. during the 75 minute sudsing operation. The washer is then stopped and drained. The wheel is filled with the necessary amount of clear water at 100° F. and run for 5 minutes. The machine is stopped again, drained and the rinsing operation is repeated. After the final rinse the washwheel is drained and the samples are transferred to the centrifuge, each sample handled as a ball. The specimens shall then be pressed, cooled and measured as described under the procedure for determination of sponging shrinkage. The felting shrinkage is the change in dimension in the distance measured after sponging and after laundering.

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Lecture Sponsored by BDTI Student Chapter

THE second of a series of lectures sponsored by the Bradford Durfee Technical Institute Student Chapter was given on the evening of November 24, 1948, by Richard McAndrew, a graduate of the Institute, now Superintendent in the U. S. Testing Laboratory in Boston, who spoke on the physical and chemical testing of wool. Thirty attended.

Respectfully submitted,

MIRIAM MURPHY,
Secretary, pro tem.

COLOUR INDEX

A few more copies of the "Colour Index" and "Supplement" of the British Society of Dyers and Colourists are available at $30.00 per set, postpaid, in the United States, from the

Secretary, AATCC
Lowell Textile Institute
Lowell, Massachusetts

TRADE NOTES • NEW PRODUCTS

• New Stein, Hall Office

The opening of a new sales office in Atlanta, Georgia has been announced by Stein, Hall & Company, Inc., 285 Madison Avenue, New York City. The manager of the Atlanta office will be E. D. Estes, who has served the organization in this same territory from the Stein, Hall Charlotte, North Carolina office. Headquarters will be at 364 Nelson Street, S.W., Atlanta, and the sales area covered will be the States of Georgia, Alabama and Florida.

Mr. Estes studied textile engineering at Georgia Tech. He began his career in the textile industry with Callaway Mills; later he held positions with this Company as Supt. of Unity Cotton Mills and as Vice President and General Manager of Valway Rug Mills. From 1935 until 1942, Mr. Estes was employed by Dan River Cotton Mills, after which he joined the Stein, Hall organization.

• Du Pont Appointment

Charles T. Mentzer, Jr., assistant manager of fine chemicals sales in the Du Pont Company's Organic Chemicals Department, has been named sales supervisor in the department's New York office. He will take his new position January 1.

Mr. Mentzer has been with the Du Pont Company since 1929 when he was graduated from the Johns Hopkins University with a bachelor of science degree in chemistry. For more than six years he was a research chemist. He moved to the department's Chicago sales office in February, 1937, and was recalled to Wilmington as assistant to the director of sales in 1942.

• m-Aminobenzotrifluoride

Pilot plant quantities of m-aminobenzotrifluoride (m-aminotrifluoro- methylbenzene) are being manufactured by the Hooker Electrochemical Company, Niagara Falls, New York. The compound is of special interest as an intermediate in the manufacture of dyes. Its formula is $NO_2C_6H_4CF_3$.

The trifluoromethyl group is chemically stable, but one or both of the hydrogens in the amino group may be substituted. Investigations reveal that other reactions including the possibility of further nuclear substitution may be carried out.

The compound is a colorless liquid with a characteristic aniline odor. Its molecular weight is 161.13; freezing point is 3° C.; boiling point is 189° C. and specific gravity is 1.303. Additional information is to be found in Technical Data Sheet No. 366.

• Tickets for Wet Processing Exhibition

Tickets for the Textile Wet Processing Industries Exposition to be held during the week of March 21st, Monday through Friday, at the 71st Regiment Armory, 34th Street and Park Avenue, New York, are available from the AMERICAN DYESTUFF REPORTER.

Persons engaged in the textile wet processing field may obtain these tickets without charge. Send your requests for as many tickets as are needed to the REPORTER at One Madison Avenue, New York 10, N. Y.

Firms interested in exhibition space may obtain further information from the office of Exposition for Trades, Inc., 36 West 47th Street, New York.

• General Aniline Appointment

Russell I. Baker, Manager of the Grasselli N. J. plant of General Aniline & Film Corporation, has announced the appointment of Dr. Francis P. Bluemmel as supervisor of process development in the Vat Color Department.

A graduate of Freiburg University, Ph.D., 1924, and a former assistant to Professor Karl Freudenberg at Karlsruhe Technical College, Dr. Bluemmel brings to his new post the background of chemical skill and "know-how" gained in 25 years of research, development and manufacture in the field of dyestuffs and their intermediates.

For nine years at the I. G. Farben plant, Ludwigshafen, he was associated with research, development and processing of various products, including azo and Palatine dyes, anthraquinone derivatives, alizarins and vat dyes.

Dr. Bluemmel joined General Aniline at Grasselli in January, 1935, and introduced more than 100 new products and processes while supervising the training of new operating personnel.

For the past three years Dr. Bluemmel has been engaged in development work on new dyestuffs and intermediates, and recently completed a special survey of intermediate and indigoid products.

• Santomerse 30-X

A new low-cost liquid wetting agent and detergent of the alkyl aryl sulfonate type was announced recently by Monsanto Chemical Company. A pale lemon viscose fluid, it is sold under the Monsanto trademark Santomerse 30-X.

The product is especially designed to give quick and effective wetting at low unit cost, and will be of particular interest to the textile industry, according to W. R. Corey, assistant sales manager of the company's Phosphate Division.

"The low price was achieved by process improvement," Corey said in making the announcement. "The product is a clear, extremely light colored solution, containing 30% solids. The solids content is made up of approximately 85% active alkyl aryl sulfonate and 15% sodium sulfate. It has remarkable resistance to decomposition by either strong acids or alkalies, even under extreme conditions."

Santomerse 30-X liquid wetting agent is recommended by the manufacturers for wet processing of textiles and many other applications where surface tension reduction and quick wetting is desired.

• Hercules Appointment

Dr. Richard E. Chaddock has been named manager of Hercules Powder Company's sales research division, according to an announcement made recently by P. W. Meyeringh, vice president. He succeeds Carl W. Eurenius, who has been named director of sales of the company's Cellulose Products Department.

Dr. Chaddock joined Hercules in September, 1945, as a technical assistant in the Research Department. Recently, he served as liaison between the Research Department's sales development section and the company's sales research division. He is a graduate of the University of Michigan, where he held the Hoffman scholarship, administered by the Chemist's Club of New York City.

• Orlon Acrylic Fiber

In the first detailed report disclosing the properties of "Orlon" acrylic fiber, the Du Pont Company's new synthetic textile fiber, Dr. Joseph B. Quig said recently the research "objective of developing an outstanding industrial fiber has been reached." Emphasizing its versatility, he said "Orlon" continuous filament yarn is the "most silk-like synthetic fiber, while

'Orlon' staple is the most wool-like we know."

The company has made no announcement concerning "Orlon" except selection of the name and announcement of the decision to make a major investment in the construction of a large plant in Camden, S. C., to manufacture the new fiber. Meanwhile, a pilot plant at the Waynesboro, Va., rayon plant is turning out limited quantities of the yarn for development and experimental purposes.

Dr. Quig, who is assistant manager of the Development Section of the Du Pont Rayon Department's Technical Division, told of the long program of research and product development that led to "Orlon," in a paper delivered to the American Association of Textile Technologists at a meeting on December 1st.

"Orlon" has a combination of properties which will give it a wide variety of uses where nylon and the rayons will not equal its performance, Dr. Quig said.

"It is apparent that 'Orlon' will supplement, rather than compete with, nylon in the industrial and domestic fabrics fields," he declared.

In apparel fabrics and for domestic applications, Dr. Quig said there were strong possibilities of "Orlon" being used for window curtains and shades, rainwear, umbrella fabric, outdoor jackets, sports clothing, dress shirts, woven lingerie, and tricot fabrics.

Probable industrial applications, he said, were in filter fabrics, awnings, autotop deckings, tents, tarpaulins, outdoor furniture, sails, electrical insulation, harvester aprons, agricultural and mine belting, chemical and marine cordage, diaphragm fabrics and nets of all kinds.

Inspired by the discovery of nylon, research scientists during the last decade have created a new era in synthetic fiber development through work with linear superpolymers, it was said.

The vinyls, such as vinyl chloride, vinyl acetate, polyvinyl chloride, and acrylonitrile, were investigated during the period by the scientists of many companies and several commercial fibers have been developed as the result of the studies.

"Concurrently," said Dr. Quig, "Du Pont's pioneering research was exploring the desirability of polyacrylonitrile as a fiber-forming and film-making material from a very broad and pioneering standpoint."

" 'Orlon' acrylic fiber became a reality," it was disclosed, "with the discovery of suitable organic solvents which can be employed for preparing solutions of polyacrylonitrile."

A pilot plant was built in 1944, Dr. Quig pointed out, but for the duration of the war, the major part of the development work on "Orlon" was concerned with military applications.

Discussing the properties of the new fiber, Dr. Quig explained that, for a long time, research was concentrated on finding a continuous filament, synthetic fiber having the warm, dry, luxurious hand of silk. At the same time, he added, Du Pont was searching for a staple which would have the exceptional bulking power, high thermal insulation, and the wrinkle recovery possessed by wool.

"Five years of searching market exploration," he said, "has convinced us that 'Orlon' is an industrial fiber of the first order. On the other hand, 'Orlon' continuous filament yarn is the most silk-like synthetic fiber, while 'Orlon' staple is the most wool-like synthetic fiber of which we have knowledge.

" 'Orlon' resistance to outdoor exposure is so good that we feel it is the best fiber we know of, natural or man-made, for outdoor uses."

High dry and wet tensile strength, high resistance to stretching, high flex life, rapid drying, bonding to resins and rubbers, dimensional stability to heated gases and liquids, resistance to acid and acidic fumes at high temperatures, resistance to insects, molds, mildew, and other microorganisms were among the outstanding properties listed for the new fiber.

With regard to outdoor resistance, "Orlon" stands in a class by itself. Reporting on an outdoor exposure test of yarn involving "Orlon", silk, nylon, linen, cotton, and viscose process rayon, Dr. Quig said that "Orlon" retained 77 per cent of its strength at the end of one and one-half years after all of the other fibers had completely failed.

In soil-burial tests with sisal, treated and untreated manila and cotton, jute, hemp, and nylon, "Orlon" retained 90 per cent of its original strength and was superior to the other fibers, he reported.

Exceptional bulking power surpassing that of wool was also reported by Dr. Quig.

With regard to dyeability, Dr. Quig stated:

"A yarn, to have the maximum utility and versatility in wearing apparel and domestic uses, must be dyeable. The first "Orlon" fiber produced commercially at Camden, South Carolina, will exhibit the present dyeing characteristics, which are limited in scope. The present yarn, which is now being produced in a pilot plant at Waynesboro, Virginia, can be dyed to pastel shades with certain acetate and basic colors, by orthodox dyeing techniques at the boil. Excellent washing fastness is obtained in all cases, but the light fastness of basic colors is unsatisfactory. The present fiber can be pigment dyed and pigment printed, by use of water-in-oil and oil-in-water emulsions containing resin binding agents.

"But what are the possibilities for achieving satisfactory coloration of wearing apparel and domestic fabrics in the future? I know that the answer to this question is one of the greatest importance to this particular audience, which will have so much to contribute to the future destiny of "Orlon". I can report to you that the dyeing problem has yielded sufficiently to laboratory research to allow me to state that "Orlon" is potentially dyeable with several classes of dyestuffs and that we are now engaged in working out practical commercial dyeing processes. It has been shown that deep, bright colors with surprisingly good wash fastness and acceptable light fastness can be obtained. Likewise, good crocking fastness and fastness to perspiration have been achieved."

• Vulcanol A-10

Vulcanol A-10 produced by Alco Oil and Chemical Corp., Trenton Ave. and William St., Philadelphia 34, is a completely compounded synthetic rubber latex composition designed specifically for coating automotive and furniture upholstery fabrics to effect good pile anchorage and good position stability of all yarns in these fabrics.

It is stated that, for production of good coatings well accepted in the trade, the coating department only needs to stir the material before use on either roller coaters or spread coaters—no thinning or thickening being necessary in the great majority of cases, although it may be thinned readily by addition of water or thickened with Alcogum A-5 and many natural gum thickeners.

It is claimed that Vulcanol A-10 coats uniformly, provides excellent anchorage, gives good yardage, gives minimum foam, cleans from equipment easily, is easily stirred, has good viscosity stability and is low in cost.

Vulcanol A-10 is based on GR-S Type IV latex and is said to contain optimum quantities of anti-oxidant, accelerator, activator, vulcanizing agent, stabilizer, reinforcing filler, thickener, and wetting agent for conditions generally obtaining in today's mills for drying and curing the applied rubber.

It is currently manufactured and controlled to the following specifications:

Solids (Oven dried at 110° C.) 32-35%.

Ash (Based on solids) 22.5—24.2%.

Viscosity (Brookfield No. 3 Sp., 20 rpm) 750—1750 cps.

Thixotropic Index 2.8—3.7.

Film Reflectance (Apparent Luminous) 21—23%.

Alcogum A-5, a synthetic thickener derived from acrylonitrile, is said to be responsible to a high degree for the excellent mechanical stability and uniform

coating characteristics of the compound. This thickener is said to endow Vulcanol A-10 with greater stability of viscosity on storage than has been observed with many of the more common thickeners. Also, the stability of Vulcanol A-10 against coagulation by extreme dilution with water is associated with the use of Alcogum A-5; a property of importance in cleaning down the equipment at the end of a production run. It is claimed that cleaning is generally accomplished by simply hosing down with water since Vulcanol A-10 can be diluted several thousand times without the formation of troublesome particles of rubber aggregates.

Alcogum A-5 contributes appreciably to the ash in Vulcanol A-10 since it gives 50% ash on the weight of the dry gum. Consequently, compounds using Alcogum A-5 for stabilization and thickening necessarily run higher in ash than similar compounds using non-ash bearing thickeners.

The ability of Vulcanol A-10 to produce uniform coatings is said to be attributable to three skillfully proportioned factors controlled by Alcogum A-5, Trenamine W-50, and Vulcatint B-35. Alcogum A-5 is said to control the viscosity and thixotropic index, Trenamine W-50 to control the spreading and penetrating ability and Vulcatint B-35 to dull the objectionable yellowness of GR-S latex films. Sufficient penetration to provide good pile anchorage and yarn position stability requires, first of all, that the aqueous compound wet the fabric and Trenamine W-50 is said to accomplish this. Once wet, the compound can spread over and penetrate between the fibers in the yarns freely if fluid enough. The thixotropic index insures, first, sufficient fluidity for long enough time to allow penetration, and, second, "freezing" of the compound before enough time has elapsed to allow penetration to the face of the fabric. This viscosity contributes to regulation of the amount of compound supplied to the cloth by roller coaters and also determines the extent of penetration in the time of maximum fluidity allowed by the thixotropic index.

• New Phloroglucinol Derivatives

Development of two new derivatives from phloroglucinol have been announced by Dr. Walter Guthmann, head of Edwal Laboratories, Inc. Both derivatives are said to have properties of interest to the cosmetic, soap, paint, dye, plastics and pharmaceutical industries.

I. 5,7-Dihydroxy-4-Methyl Coumarin ($C_{10}H_8O_4H_2O$) Molecular weight 210 (monohydrate). Yellow free flowing material. Melting range 280-286° C. Moisture 9 per cent. Soluble in alcohol and aqueous alcoholic solutions, sodium carbonate, and sodium hydroxide solution. Insoluble in ether, benzene and water. *Soaps:* the compound is said to have distinct uses as whitening agent. *Dyes:* compound is said to give gleaming white color to clothes and wall paints. *Plastics:* said to make plastics clear, white or opaque, small proportion added to yellow plastic, for example, will give white or clear product. Available in research quantities.

II. 5,7-Dihydroxydimethyl Coumarin ($C_{11}H_{10}O_4$). Molecular weight 206. Melting range 300-305° C. Moisture 5 per cent. Similar in other physical properties to the mono-methyl compound described above. Suggested uses: similar. Availability: research quantities.

• Sequestrene

The Alrose Chemical Company, P. O. Box 1294, Providence, 1, R. I., announces that it is now offering Sequestrene to textile dyers and finishers and to dyestuff and specialty manufacturers.

Sequestrene (ethylene bis-iminodiacetic acid) is available commercially as the purified free acid and as the technical sodium salt. It may be best described as a water softener; a non-hydrolyzable organic counterpart of the polyphosphates; a water soluble ion exchanger.

It is stated that, because of its ability to bind calcium, magnesium, iron, copper, zinc and many other metals in a soluble but non-ionized form stable over a wide range of pH and temperature, Sequestrene has found uses such as:

Solubilizing and dispersing many types of dyes and pigments; preventing shade changes in dyeings as the result of trace metals such as copper and iron; preventing spotting and reduced color yield with acetate colors; preventing livering of printing pastes; rancidity retardant in tallow softeners; stripping of after-chromed, after-coppered dyeings; stabilizing peroxide baths; preventing harshening of fabrics scoured with silicates; clarifying sulfonated oils, liquid soaps; stabilizing rubber latices for impregnation purposes, etc.

A 22 page bulletin is available on request.

• Literature on Compounds G-4 and G-11

An annotated bibliography of the literature of Compound G-4 and Compound G-11 has been published as the Autumn 1948 issue of *Sindar Reporter*, publication of Sindar Corporation of New York. The bibliography, which contains references and abstracts of almost one hundred scientific and trade articles and patents, indicates that these substances have found widespread acceptance as fungicides, antiseptics, and germicides in the soap, textile, cosmetic, and other fields. Copies of the bibliography are available upon request to Sindar Corporation.

• DCAT Annual Dinner and Meeting

March 10, 1949 has been set as the date of the 23rd Annual Drug, Chemical & Allied Trades Dinner, according to announcement in the *DCAT Current Digest*, monthly bulletin of the Drug, Chemical & Allied Trades Section, New York Board of Trade. The forthcoming dinner will be held at The Waldorf-Astoria, New York City.

The dates of the 59th Annual Meeting and Election of the DCAT were also announced. This two-day meeting will take place Friday and Saturday, September 23rd and 24th, 1949, at Shawnee Inn, Shawnee-on-Delaware, Pa.

• Projected Du Pont Plant

The purchase of one tract and the exercise of an option on another—1,700 acres in all—in the Guadalupe River valley, near Victoria, Texas, for a projected chemical plant was announced recently by E. I. du Pont de Nemours & Co.

The Ammonia Department has concluded preliminary engineering studies of the site, with a view toward building there a third plant to make chemical intermermediates for nylon.

• Carwin Company Appointment

C. E. VanWinckel, President of The Carwin Company of North Haven, Connecticut, manufacturers of dye intermediates, announces the appointment of Richard Kithil as Vice-President in Charge of Sales.

Mr. Kithil was formerly associated with Carbide & Carbon Chemicals Corporation, Fine Chemicals Division, in New York.

• Conco Non Slip No. 14

Continental Chemical Co. announces its new fiber bonding agent Conco Non Slip No. 14 which it states has unique properties in that it is an extremely efficient Non Slip on acetates, rayons or silks and yet adds little weight or body to the fabric. Moreover, the fabric is said to stay on the soft side. It is now in quantity production.

Animalization of Cellulosic Fibers

(Concluded from Page 858)

The fastness to water, which is lacking, particularly in fibers animalized with polyalkylene amines or imines and dyed with Supranol or Supramine dyestuffs, can be improved by means of an aftertreatment with mordants such as tannin and its synthetic substitutes *(96)*.

In fibers that have been animalized with resins we note that the chlorine fastness of the shades obtained with acid dyestuffs is improved. In this case the phenomenon known as chlorine retention plays the role of preferential absorption of chlorine by the resin in such a way as to protect the dyestuff. According to a recent patent the presence *(97)* of a small amount of urea-formaldehyde resin, would have improved effect on the chlorine fastness of a cellulosic cloth printed with acid dyestuffs.

The light fastness can be increased by treating the animalized fibers, before, during or after the dyeing with a solution of poly - halogen - polyhydroxy-triphenyl-methanesulfonic acids or with the organic non-basic compounds of 10-30 C atoms containing sulfonic acid radicals, as for instance the sulfuric esters of high molecular weight aliphatic alcohols or the alkylated naphthalenesulfonic acids *(98)*.

An example consists in treating the animalized fiber with 0.6 gr./L. of 3,5-3′5′ tetrachloro-2-2′ dihydroxy - triphenylmethane-2-sulfonic acid and 0.2 gr./L. of 30% acetic acid, which maintains the light fastness which would result on wool.

Special colored effects are possible with fibers animalized with albumin. This, as we have seen, coagulates at the periphery of the fiber and so dichroic effects can be obtained. By dyeing with a brilliant acid green reserving cellulose, and topping with a direct red it is possible to obtain chromatic effects which differ according to the angle of vision.

Other effects are obtained *(99)* by dyeing a normal cellulosic fabric with substantive dyestuffs, then printing on an animalized resin, and topping with acid dyestuffs which are fixed only on the printed points.

Conclusion

We have endeavored in this paper, to review what has been done in the field of animalization, by indicating the development of the concepts and methods and by considering the results.

The industrial applications are still unsatisfactory from certain points of view but we look forward to the complete solution of this problem to the advantage of the textile industry.

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IMPORTANT ANNOUNCEMENT

DURING 1949

the

American Dyestuff Reporter will publish

FOUR SPECIAL ISSUES

MARCH 7th → TEXTILE WET PROCESSING EXPOSITION, which will be held in the 71st Regiment Armory, 34th Street, corner of Park Avenue, New York City, MARCH 21, 22, 23, 24, and 25, 1949.

APRIL 18th → KNITTING ARTS EXHIBITION to be held in Atlantic City, New Jersey, APRIL 25th through 29th, 1949.

OCTOBER 3rd → A.A.T.C.C. CONVENTION NUMBER, covering the Annual Meeting and Convention to be held in Atlantic City, New Jersey, OCTOBER 13th to 15th, 1949.

DECEMBER 12th → ANNUAL PROCESSING REVIEW NUMBER. This issue as usual, will feature all new dyestuffs, chemicals, processing equipment, etc., developed during 1949.

Advertisers desiring to use these special issues should make space reservations now.

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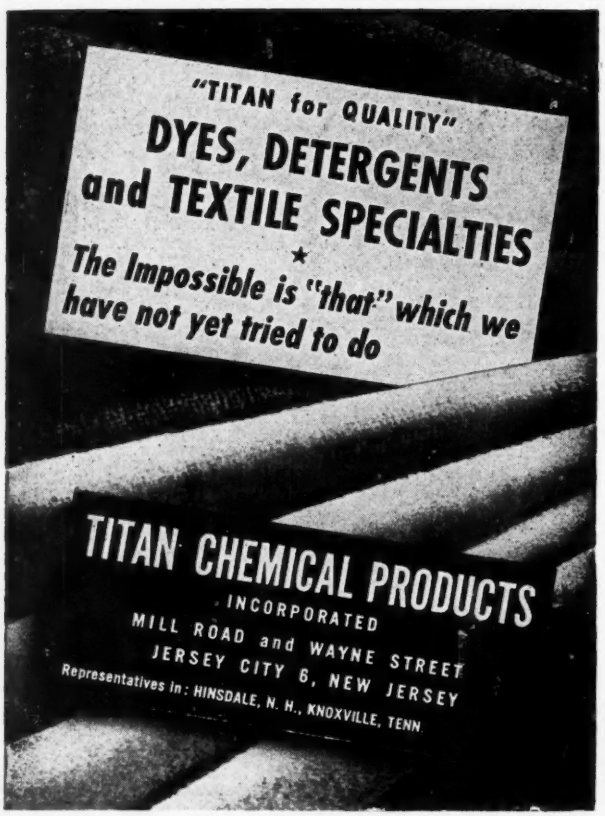
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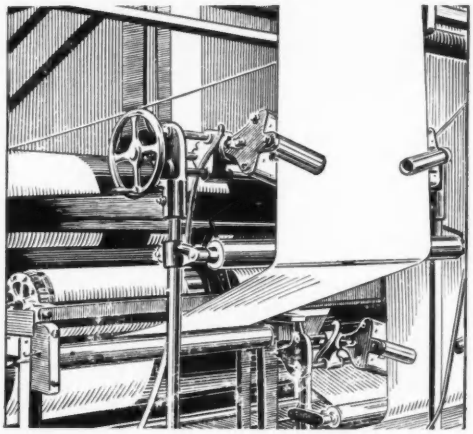

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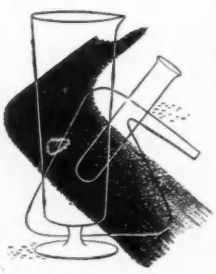

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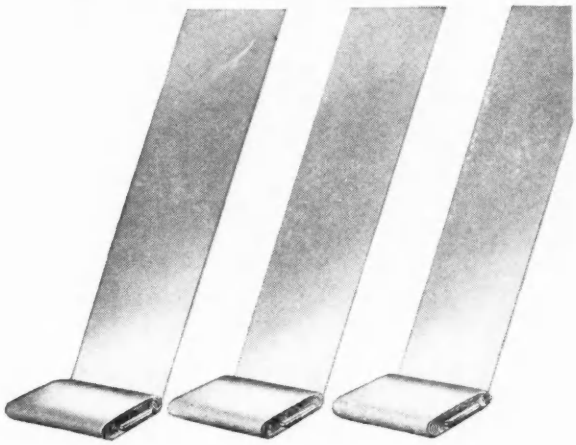

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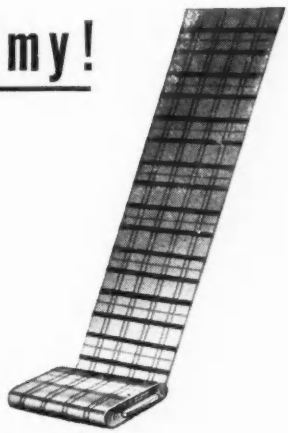

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DECEMBER . .	12‡-26

OFFICIAL PUBLICATION, PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

†A.A.T.C.C. Convention Issue
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- *but at this time of the year we pensively halt for a brief moment —*
- *to reaffirm our belief in the brotherhood of man and in everlasting peace —*
- *to wish our many friends in many lands a joyous Christmas and a Happy New Year.*

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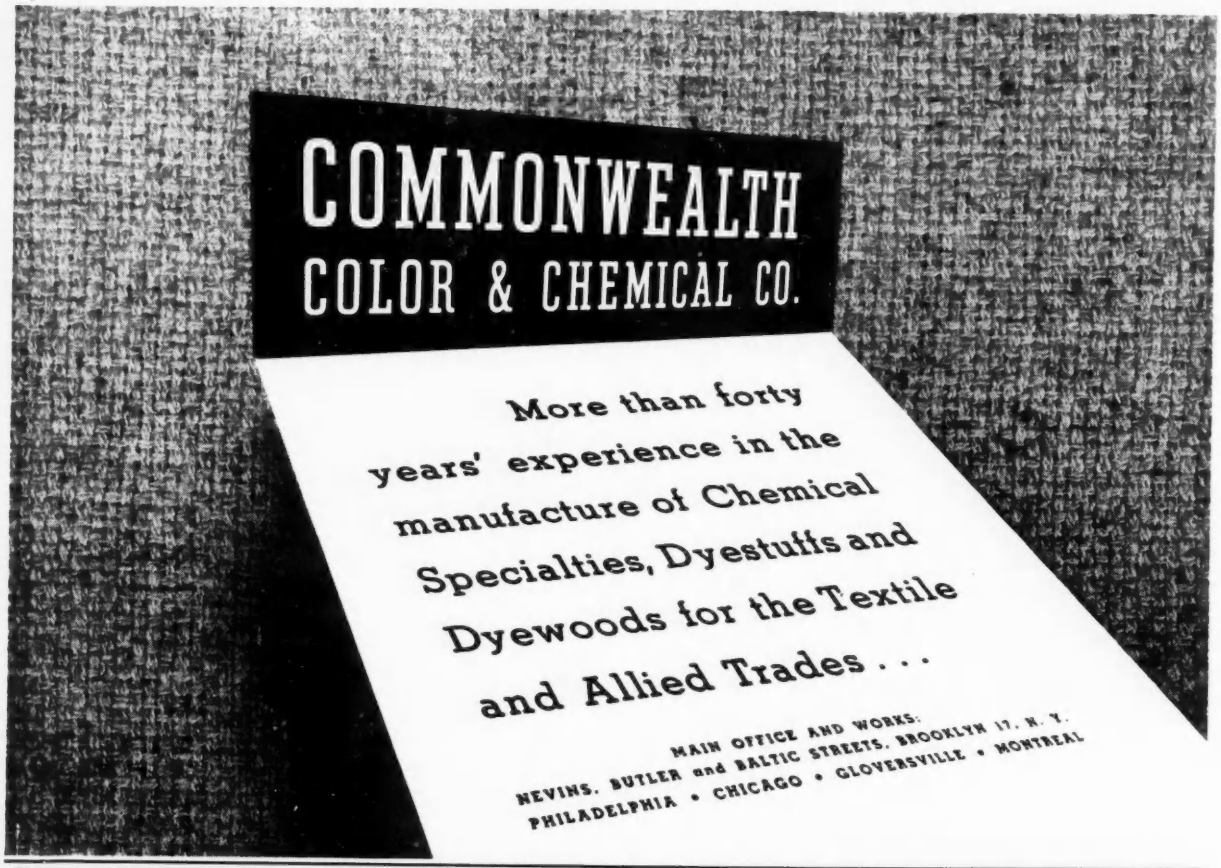
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